azbil

CM2-SVX100-2001

Smart Valve Positioner for Rotary Valve

Model SVX100/102

User's Manual

Azbil Corporation

NOTICE

While the information in this manual is presented in good faith and believed to be accurate, Azbil Corporation disclaims any implied warranty of merchantability or fitness for a particular purpose and makes no express warranty except as may be stated in its written agreement with and for its customer.

In no event shall Azbil Corporation be liable to anyone for any indirect, special or consequential damages. This information and specifications in this document are subject to change without notice.

Safety

Precautions for Use

For safe use of the product, the following symbols are used in this manual.

⚠WARNING	Warnings are indicated when mishandling the product might result in the death or serious injury of the user.
⚠CAUTION	Cautions are indicated when mishandling the product might result in minor injury to the user or damage to property.

■ In describing the product, this manual uses the icons and conventions listed below.

Use caution when handling the product.

The indicated action is prohibited.

Be sure to follow the indicated instructions.

Handling Precautions:

Handling Precautions indicate items that the user should pay attention to when handling the SVX.

To use this product correctly and safely, always observe the following precautions.

We are not responsible for damage or injury caused by the use of the product in violation of these precautions.

Handling Precautions for This Product

Installation Precautions

	⚠WARNING
	When installing, use proper fittings and proper tightening torque for connections to the process and to the exhaust. Gas leakage is dangerous because process gas and calibration gas are flammable. Please refer to the leak check instructions in this manual and verify that there is no gas leakage.
	Do not use the product except at the rated pressure, specified connection standards, and rated temperature. Use under other circumstances might cause damage that leads to a serious accident.
	For wiring work in an explosion-proof area, follow the work method stated in the explosion-proof policy.

⚠ CAUTION
After installation, do not step or stand on this unit. Doing so may damage the device or cause injury.
Bumping the glass of the display with a tool may cause damage or injury. Be careful.
Install the device correctly. Incorrect or incomplete installation will cause output errors and violation of regulations.
This product is quite heavy. Protect your feet with safety shoes when working.
Do not subject the product to shock or impact.

Wiring Precautions

⚠ WARNING
Do not do wiring work with wet hands or while electricity is being supplied to the product. There is a danger of electric shock. When working, keep hands dry or wear gloves, and turn off the power.

⚠ CAUTION
When wiring, check the specifications carefully and make sure to wire correctly. Incorrect wiring can cause device damage or malfunction.
Supply electric power correctly according to the specifications. Supplying power that differs from the specifications can damage the device.
Use a DC power supply that has overload protection.

Maintenance Precautions

⚠ WARNING
When removing this device for maintenance, be careful of residual pressure or residual process gas. Leakage of process gas is dangerous.
When working on the vent, check its direction so that people do not come into contact with vented gas. There is a danger of burns or other physical harm.
When the device is being used in an explosion-proof area, do not open the cover. Opening the cover may cause an explosion.

⚠ CAUTION
This product was kept under carefully controlled conditions until it was shipped. Never try to modify this device. Doing so could damage it.

Unpacking

Handle with care to prevent damage. Check that the following items are included:

- Smart Valve Positioner for Rotary Valve model SVX100, SVX102
- Feedback lever
- Two hex socket bolts (only for stroke lever type)
- Hex bolt and spring washer (only for fork lever type)
- Hex wrench (for feedback lever - only for stroke lever type)
- Mounting kit (option)
- Manual (Option)

Verifying the specifications

The Smart Valve Positioner for Rotary Valve specifications are written on the name plate on the body of the positioner itself. Compare these specifications to those in the appendix, and verify that the Smart Valve Positioner for Rotary Valve matches your order. In particular, be sure to check the following items.

- Tag number (TAG NO.)
- Model number (MODEL)
- Factory number (PROD.)
- Input current range (INPUT)
- Air supply pressure (SUPPLY)

Inquiries

If you have any questions about the specifications, please contact the office listed at the back of this user's manual. Have the model number (MODEL) and factory number (PROD.) number ready when you call in your question.

Storage

Ideally, the SVX should be stored in the original packaging. However, if the original packaging is not available, store the SVX indoors at normal temperature (25°C {77°F}) and humidity (60% RH) in a place free from vibration and shock and not exposed to rain or water. If you are storing the SVX after it has been used, clean the SVX and then firmly tighten the terminal box cover and seal the wiring, piping connections and bleed hole in the pilot cover using the Azbil Corporation-supplied caps or tape to prevent entry of moisture.

Table of Contents

Chapter 1. Introduction

1-1. Overviews

The SVX is an intelligent valve positioner that can be connected to a 4-20 mA controller output signal line. Since all adjustments can be performed electrically, the relationship between the input signal and the position of the control valve can be set arbitrarily. Split range and other special settings are also easy to set up.

An overview of an SVX system is shown below.

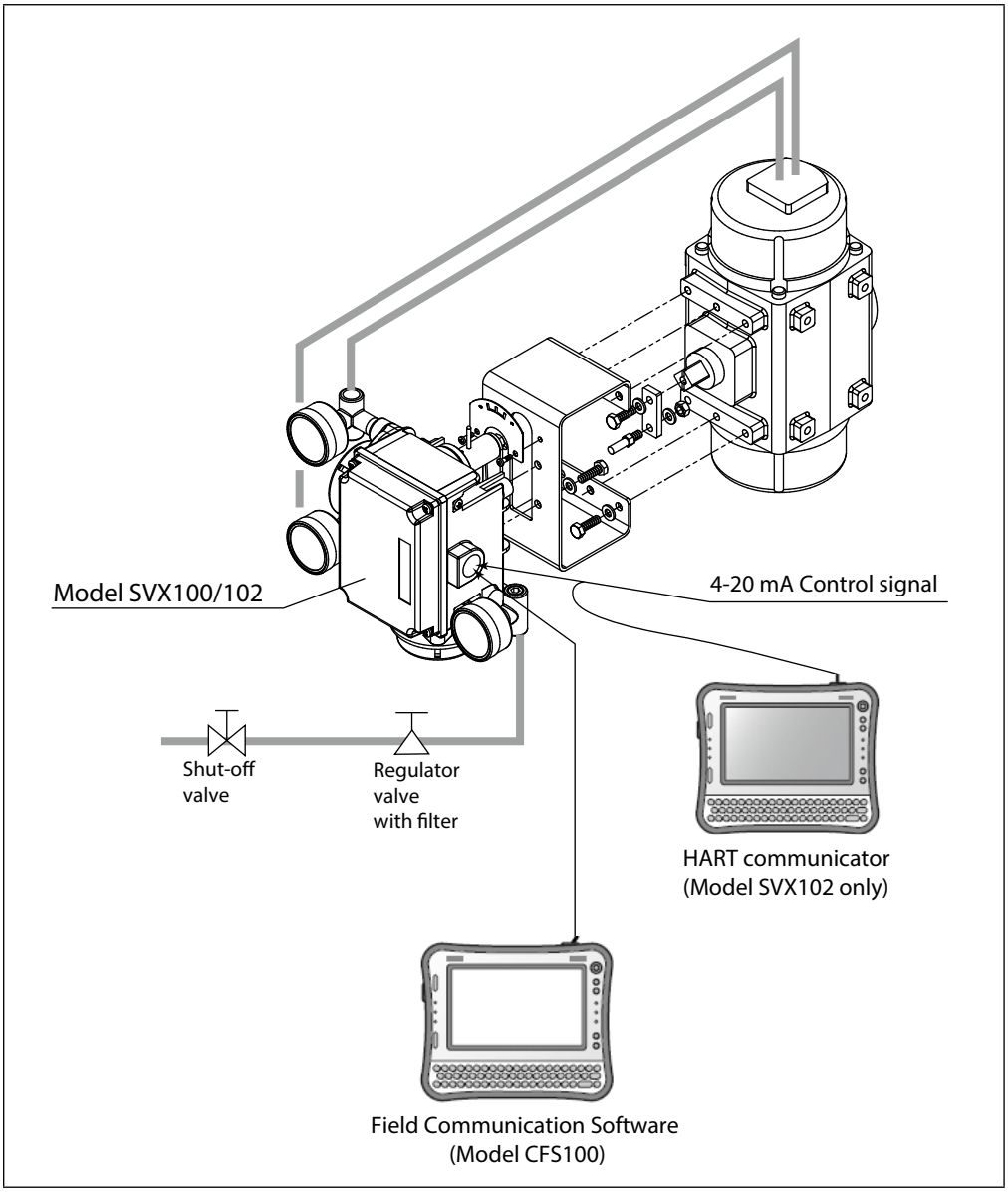


Fig. 1-1. SVX overview

Models

Model SVX100: Analog signal (4 to 20 mA DC)

Model SVX102: Analog signal (4 to 20 mA DC) with HART communication protocol

1-2. System structures

Model SVX100

Data can be written to and read from the SVX database by using the Field Communication Software (model CFS100) in a system structure as illustrated below.

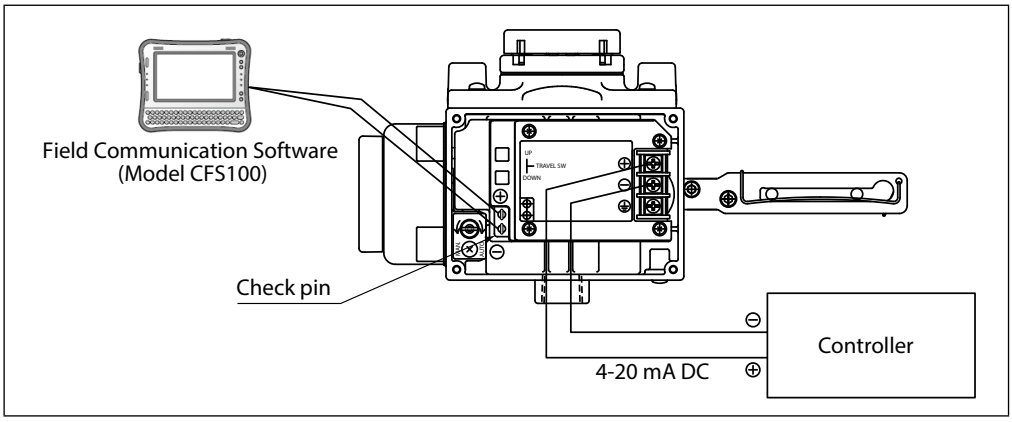


Fig. 1-2. System structure for model SVX100

Model SVX102

Data can be written to and read from the SVX database by using the HART communicator in a system structure as illustrated below.

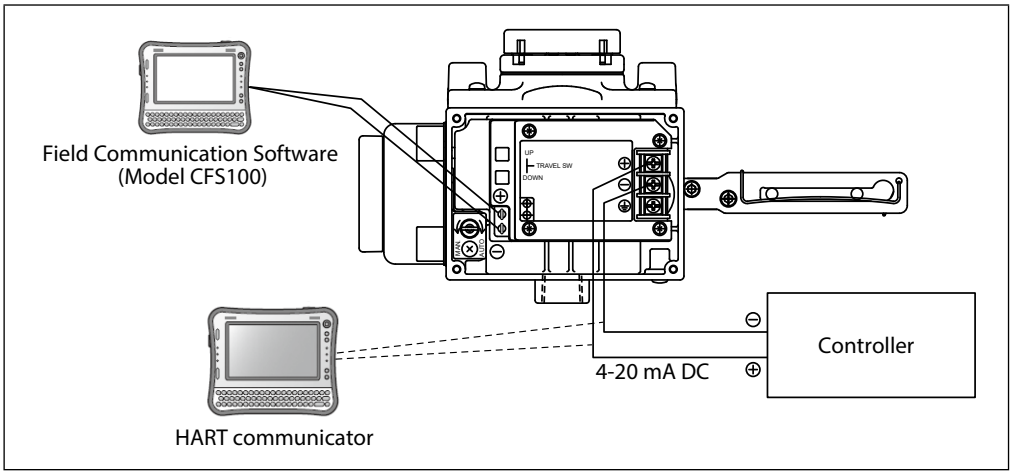


Fig. 1-3. System structure for model SVX102

1-3. Communication

There are three ways to communicate with the SVX: manually, using the Field Communication Software (model CFS100) or using a HART communicator.

Manual configuration

Initial SVX configuration is typically performed using a switch Auto-Setup, which detect the characteristics of the valve, as well as zero and span adjustment can all be performed automatically.

Using the Field Communication Software (model CFS100)

Azbil Corporation's Field Communication Software (model CFS100) can be used for all configuration, calibration and maintenance of the SVX. SVX-original communicator functions are documented fully in this manual. See the user's manual for model CFS100 to learn more about the product.

Using a HART communicator

Emerson Electric HART communicator can be used for all configuration, calibration and maintenance of model SVX102. SVX-original communicator functions are documented fully in this manual. See the HART communicator manual to learn more about the HART communicator.

According to need, update a software and device description files of HART communicator.

1-4. Structures and functions of SVX

Main components

The main SVX components are shown below.

Integral type (model SVX100/102)

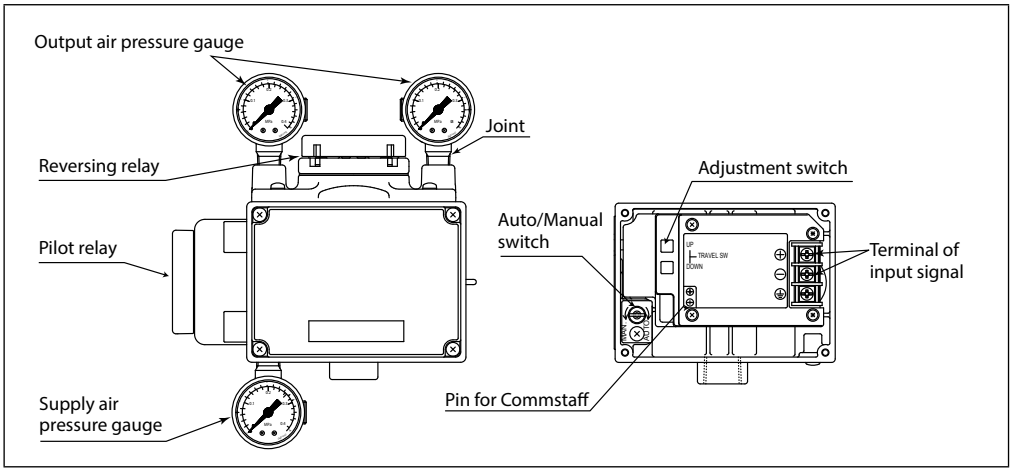


Fig. 1-4. Front view

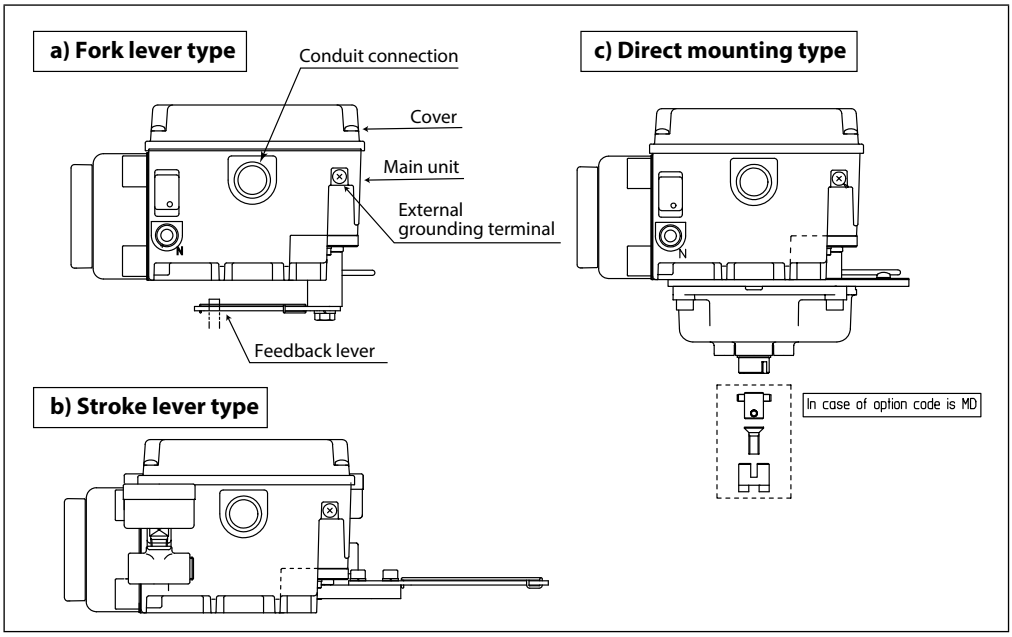


Fig. 1-5. Under view

Names parts and functions of main components

Part	Description
Main unit	Holds the electronics module, EPM (electro-pneumatic converter module), and VTD (position sensor).
Pilot relay	Amplifies the pneumatic signal from the EPM (electro-pneumatic converter module) and converts it to a pneumatic signal for the actuator.
Feedback lever	Acquires the motion of the control valve and transmits it to the VTD (position sensor).
Auto/Manual switch	Switches the control method for the pneumatic output between the automatic operation state and the manual operation state. Refer to “5-2-1: Auto/Manual selection switch” on page 59. for information on operating procedures.
Zero and span adjustments Auto-setup switch	Allows the zero and span to be adjusted and auto setup to be performed with just a switch without using the communicator. *Note) Do not operate when supply air pressure is not supplied in normal condition.*
Supply air pressure gauge	Indicates the supplied air pressure.
Output air pressure gauge	Indicates the pressure of the output air.
Air supply connection	The air supply is connected to this connector. Labeled “SUP”.
Output air connection (OUT1)	The air output from this connector is delivered to the actuator. “1” is written on the reversing relay.
Output air connection (OUT2)	The air output from this connector is delivered to the actuator. “2” is written on the reversing relay.
Terminal of input signal	Labeled “I IN” Connect the signal cable from the host controller.
External grounding	Ground this pin as stipulated in the specifications.
Internal grounding	When using the SVX, use either the internal or the external ground terminal, but be sure not to create a 2- point ground.
Conduit connection	Port for connection cables.
Pin for model CFS100	The SVX can communicate with model CFS100 if the model CFS100 communication cable hooks are connected to these pins.
Cover	Waterproof construction.

Chapter 2. Installation

2-1. Site selection

The SVX is designed to withstand severe operating conditions. It is designed to operate:

- Ambient temperature range of -40 to +80°C (-40 to +176°F).
- In relative humidity of 10 to 90% RH.
- Where there is no chance of sudden temperature or humidity changes
- Where magnetic field induction is not more than 400 A/m (Avoid locations near large-scale transformers, high-frequency furnaces, and similar equipment.)
- Vibration under 19.6 m/s^2 (5 to 400 Hz)

Note) The vibration conditions for this equipment is stipulated for the vibration at the positioner.

2-2. Installing SVX

Smart Valve Positioner for Rotary Valve designed for use in combination with rotary valve. The SVX weighs about 1.8 kg. It should be attached in the same way you would attach a conventional current-pneumatic positioner.

⚠CAUTION

- Do not install the SVX near a large transformer, high-frequency furnace, or other equipment that generates a magnetic field. Unexpected operation can result.
- Incorrect settings can reduce the SVX's effectiveness and cause damage to or failure of the SVX.
- When installing a control valve, provide adequate clearance around the valve for maintenance (piping, wiring, and adjustment), and verify that the valve is oriented correctly.
- Transport the SVX in its original packing to as close to the point of installation as possible.
- Do not apply excessive force to the feedback lever or bend the feedback pin when installing the valve.
- Be sure to tighten bolts and nuts securely on the SVX and control valve.

⚠WARNING

- To avoid physical injury, use caution when attaching the SVX.
- Be aware of sharp edges, such as the threaded edges of cover and any sharp edges on the unit.
- The type and size of the actuator and the SVX settings determine the type of mounting plate to be used. If you ordered your SVX with the actuator type specified, then the SVX should come with the proper mounting kit, and the correct actuator settings should already be programmed into the SVX. The Auto-Setup program is then used to calibrate the SVX.

Procedure for fork lever type

step	Procedure
1	The SVX comes with an actuator mounting kit appropriate to your control valve and actuator. Fasten the mounting plate to the rear of the SVX securely, using the four hexagon head bolts (M6 × 12) and spring washers provided.
2	Fasten the SVX (mounting plate) securely to the actuator's mounting structure using the bolts and washers provided. During this operation, pass the actuator's feedback pin through the slot in the SVX feedback lever.

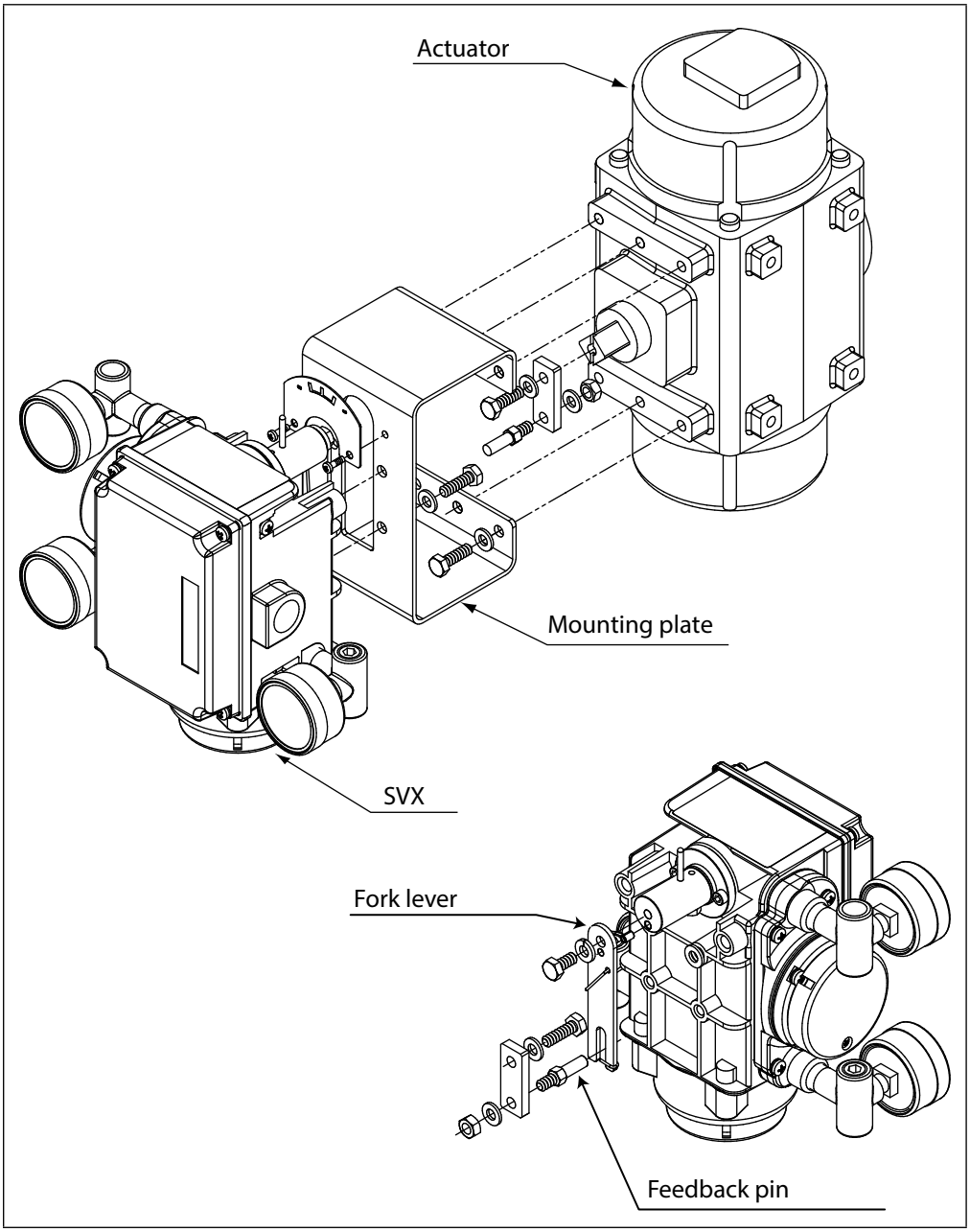


Fig. 2-1. Mounting the rotary cylinder actuator (fork lever type)

Procedure for stroke lever type

step	Procedure
1	The SVX comes with an actuator mounting kit appropriate to your control valve and actuator. Fasten the mounting plate to the rear of the SVX securely, using the two hexagon head bolts (M8 × 20) and spring washers provided.
2	Fasten the SVX (mounting plate) securely to the actuator's mounting structure using the bolts and washers provided. During this operation, pass the actuator's feedback pin through the slot in the SVX feedback lever.

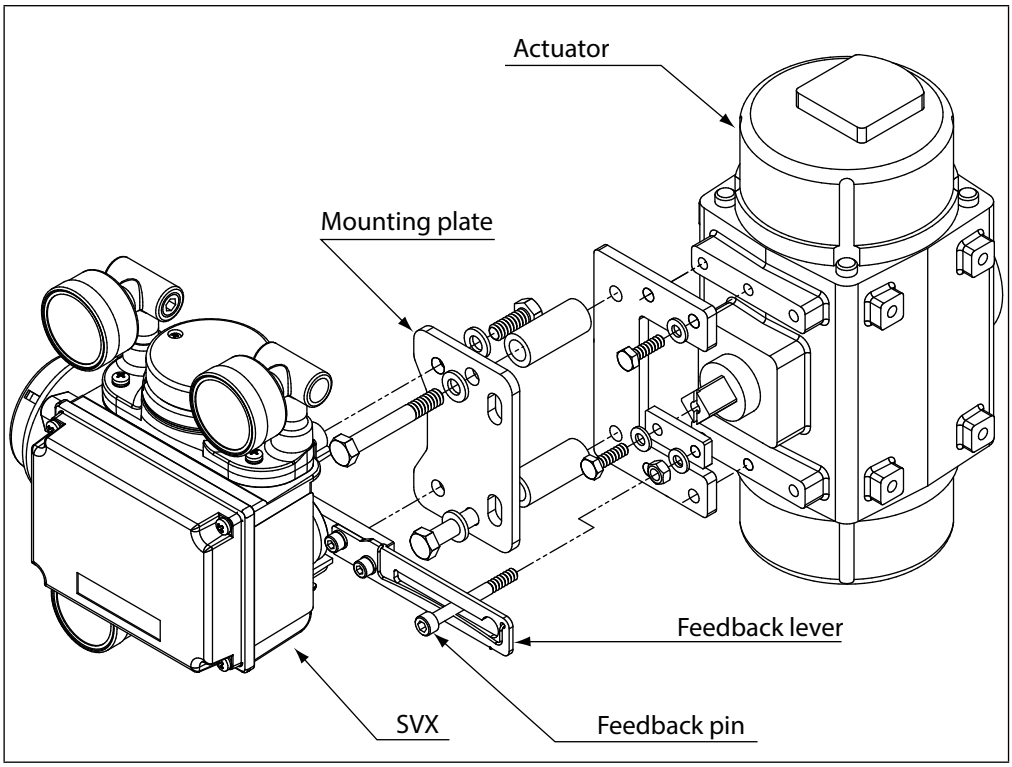


Fig. 2-2. Mounting the rotary cylinder actuator (stroke lever type)

Note) Please avoid mounting the feedback lever pin between the valve stem and the positioner lever rotary shaft.

Procedure for direct mounting type

step	Procedure
1	The SVX comes with an actuator mounting kit appropriate to your control valve and actuator. Fasten the mounting plate to the rear of the SVX securely, using the four hexagon head bolts (M6×12) and spring washers provided.
2	Fasten the SVX (mounting plate) securely to the actuator's mounting structure using the bolts and washers provided. During this operation, put the SVX feedback stem in actuator stem with a joint.

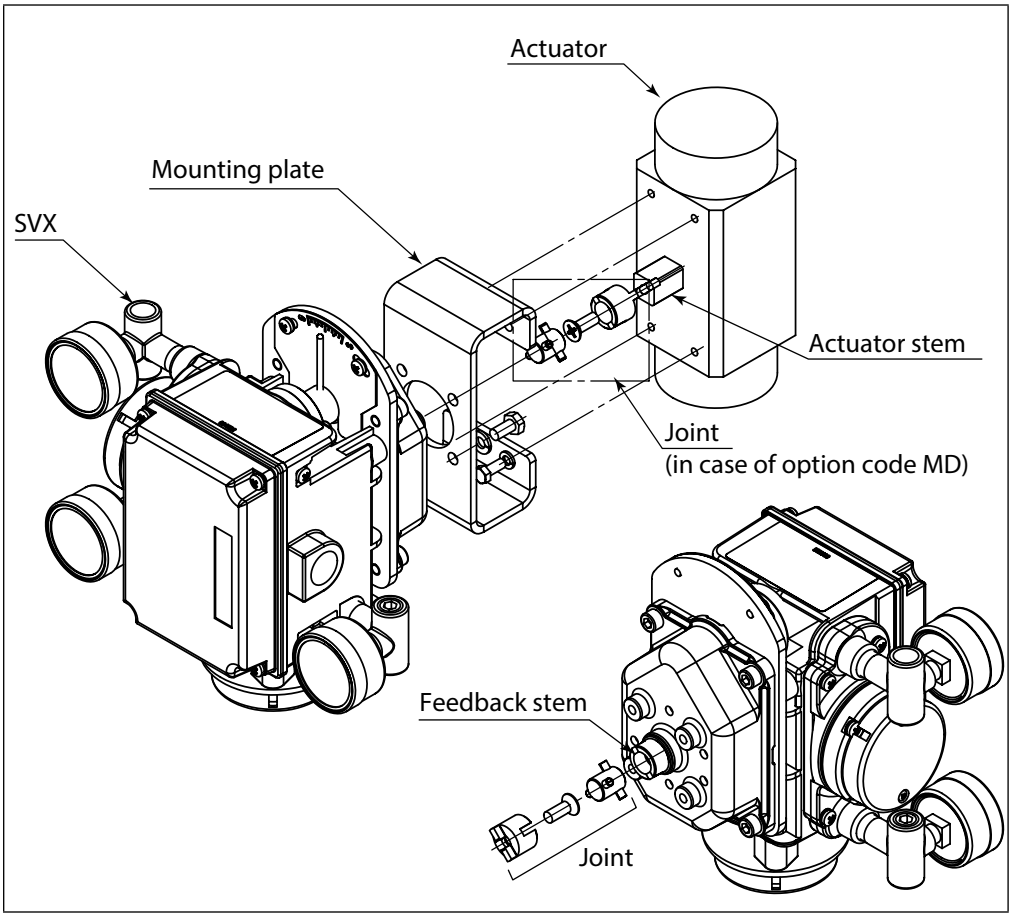


Fig. 2-3. Mounting the rotary cylinder actuator (direct mounting type)

⚠CAUTION
Confirm that the direction of valve stem rotation matches the SVX feedback stem direction, when SVX is mounted on the actuator. If the direction did not match, the apparatus is broken.

Connecting the feedback pin and the feedback lever

The following points must be observed when connecting the SVX feedback lever and the feedback pin on the actuator. These parts must be connected correctly.

(1) Only a 6 mm diameter pin may be used.

(2) The pin must be caught between the guide and the spring.

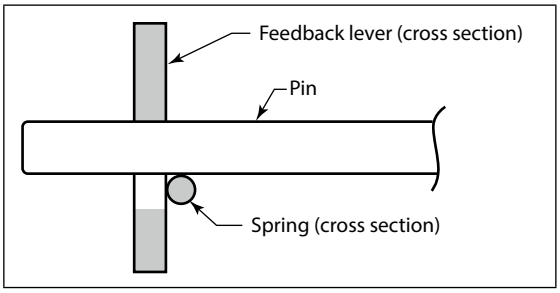


Fig. 2-4. Feedback pin and feedback lever connection

(3) The angle between the feedback lever and the pin must be 90° when seen from above.

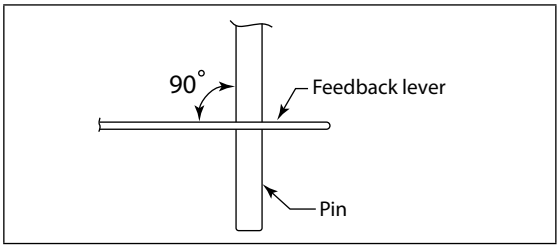


Fig. 2-5. Angle between feedback lever and pin

(4) Assemble the feedback lever and the SVX using the two hex socket bolts provided. The feedback lever rotates up to 20° from the horizontal (40° travel). If this limit is exceeded, then the SVX will not operate properly. (Minimum angle of rotation is ±4°)

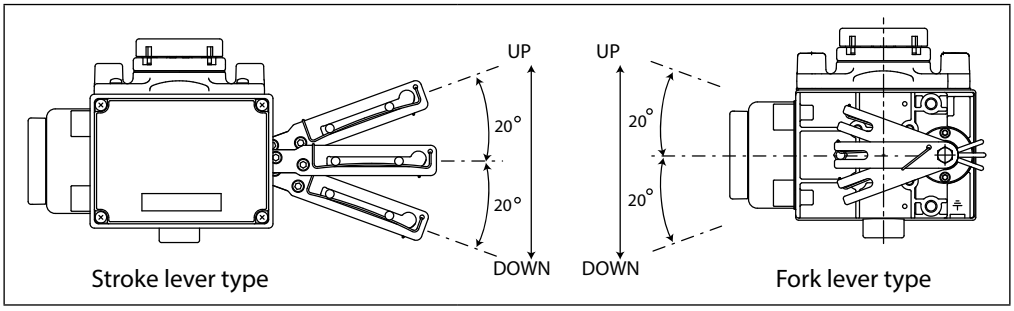


Fig. 2-6. Feedback lever maximum range of motion

Connecting the Air Supply

Clean and dry supply air ensures long-term stability of the SVX.

Instrumentation equipment air

Since this flowmeter employs a flapper nozzle mechanism in the electro-pneumatic converter, if the instrumentation equipment air is contaminated or contains oil or moisture, its functioning as a positioner could be disabled or it could cause an unrecoverable failure. Therefore, the quality of the instrumentation equipment air to be supplied to this flowmeter is defined as follows:

- Solid body: there must be no particles whose diameter is over 3 μm.
- Oil: It must be less than 1 ppm in mass.
- Humidity of the supplied air: The dew point temperature must be at least 10 degrees Celsius lower than the temperature of the equipment body.

Taken from JIS C1805-1 (2006)

Follow the specifications described above to select a compressor and a main-line type or end-installation type compressed air cleaner.

(1) Compressed air cleaner for main lines

Select a main line filter and a compressed air cleaner for main lines such as the micro-alescer produced by SMC Corporation or CKD Corporation, which are famous as compressed air cleaner makers, to satisfy the above-mentioned specifications.

(2) End-installation type compressed air cleaner

If fundamental measures for main lines cannot be taken because of any problem related to, for example, the control valve installation, install an end-installation type compressed air cleaner (oil mist removal equipment) to supply instrumentation equipment air to the flowmeter through this compressed air cleaner.

<Examples of recommended equipment>

Products produced by SMC Corporation

Mist separator

AM150, AM250 series

(filtration 0.3 μm, secondary oil mist concentration: 1.0 mg/m^3)

Air combination

Filter regulator + mist separator

AW30 series (filtration rate: 5 μm) + AFM30 series (filtration rate: 0.3 μm)

Products produced by CKD Corporation

Oil mist filter

M1000, M3000 series

Mantle S type (filtration rate: 0.3 μm, residual oil: 1.0 mg/m^3)

Note) Select specifications of a compressed air cleaner in accordance with the conditions of use.

Even if the oil mist removal equipment mentioned above is installed, proper inspections and maintenance of the pneumatic circuit are necessary for long-term stable operation. Be sure to conduct periodic inspections and maintenance of the instrumentation equipment along with the installation of oil mist removal equipment.

Any failures of this flowmeter caused by unsatisfactory quality of the instrumentation equipment air are not covered by the warranty.

Pressure regulator with filter

- The control valve can be operated manually by using this regulator in conjunction with the Auto/Manual switching function.
- Use a 3 μm or better filter to solid-state particulate matter from the air supply.
- If a filter is not provided on the regulator, insert a separate 3 μm or better filter immediately before the regulator.

Shutoff Valve

- This valve is used to temporarily shut off air supply to the SVX.
- The shutoff valve enables disconnection of the SVX from the control valve for ease of maintenance.

Recommended piping practices

- Air supply pipes should have an inside diameter of 6 mm {1/4 inch} (8 mm {3/8 inch} outside diameter tubing recommended).
- Pipes should match the installation environment, i.e. for a corrosive environment, use vinyl-covered copper pipes.
- Use joints that precisely fit the pipes.
- Sealing tape is preferable to solid or liquid sealants for pipe joints to SVX air connections. Prevent sealing tape/sealant from entering pipes.
- Use the right length of piping; avoid excess lengths.
- Completely flash pipes before use, checking for burrs and other problems.
- Check for leaks after installation.

Connection position

Positioning for the supply air connection and the output air connection are shown below.
The thread size for the connection can be selected to specifications.

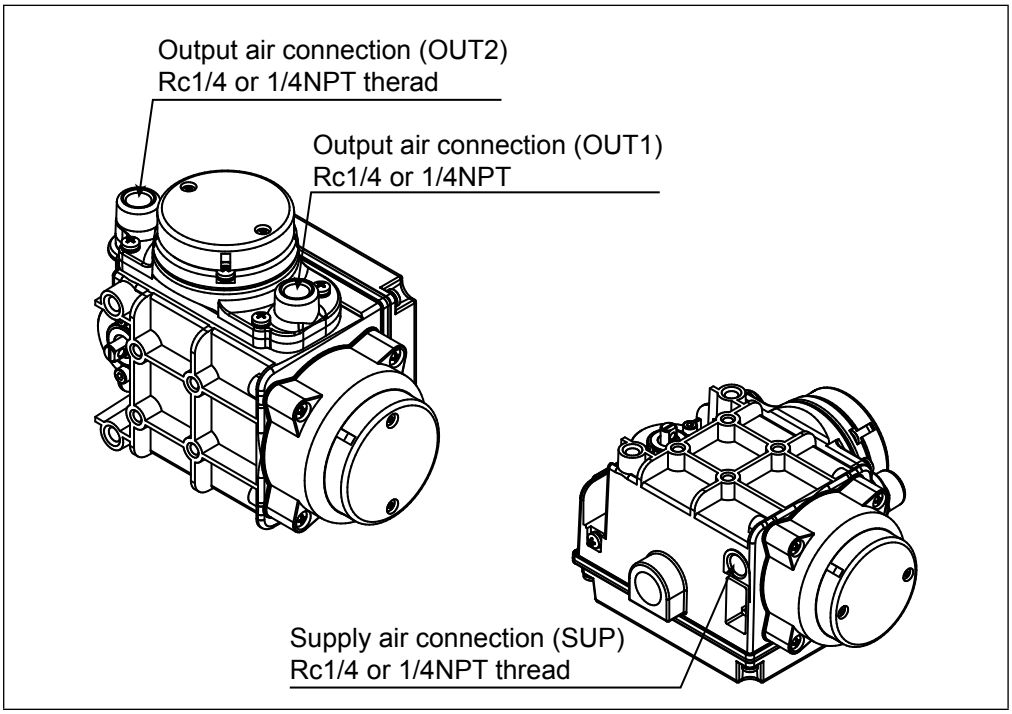


Fig. 2-7. Connecting the air supply (without pressure gauge)

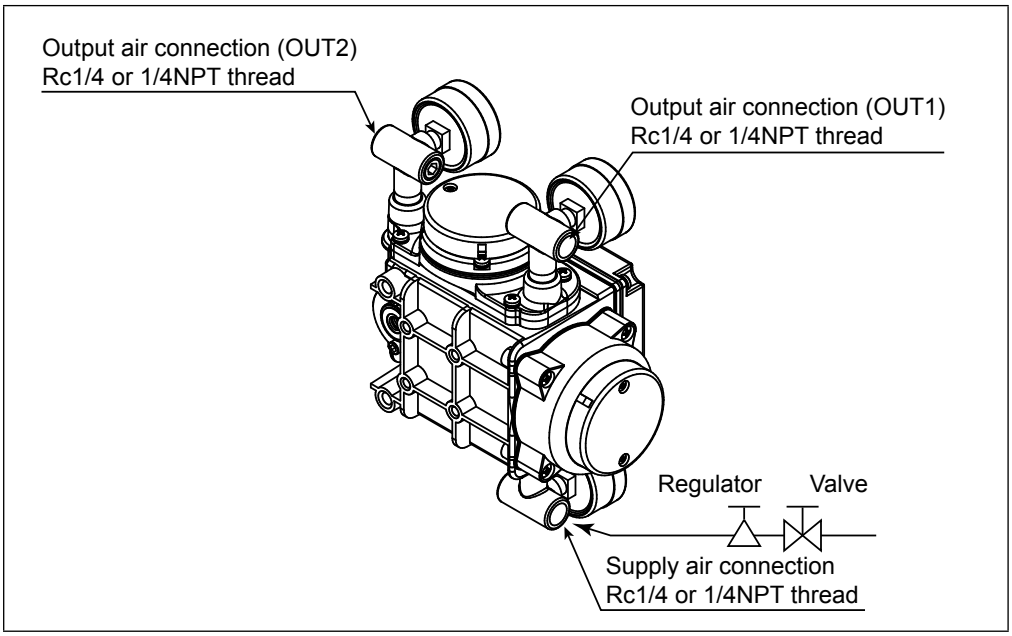


Fig. 2-8. Connecting the air supply (with pressure gauge)

Procedure for air pipe connection

Step	Procedure
1	Remove the dust plug from the output air connection on SVX.
2	Connect the joint to the air output connection using sealing tape. *Note) Sealing tape is preferable to solid or liquid sealant for pipe joints to SVX air connections. Prevent sealing tape/sealant from pipes.*
3	Connect the other air connection to each joints. *Note) Completely flash pipes before use, checking for burrs and other problems.* *Use the right length of piping avoid access lengths.*
4	Check for leaks after installation.

2-3. Electrical wiring

2-3-1. Wiring

⚠WARNING
• ELECTRICAL SHOCK HAZARD! Turn off power before performing any wiring.

Electrical wiring (model SVX100/102)

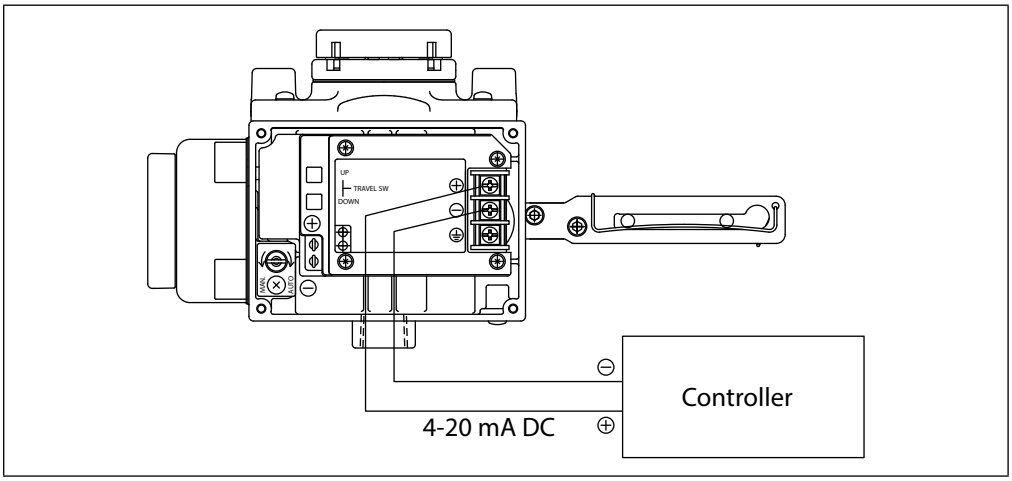


Fig. 2-9. Electrical wiring for model SVX100/102

■ Use only one of the two ground terminals (internal and external) to ground the SVX. Perform this work according to all local laws and ordinances governing electrical work.

Cables

■ Use stranded cables having a conductor cross-section of 1.25 mm^2 and suitable for 600V such as shown in the conductor table in Article 310 of the NEC (National Electric Code). Outside diameter on cables must be 1/4 inch to 7/16 inch {7 mm to 12 mm}. In a location that can be affected by electrical noise, run shielded wires through a metal conduit.

■ Select a sheath material that can withstand the cable installation environment (including the ambient temperature, corrosive gasses, corrosive liquids).

■ Bring the cable to the terminal box through the conduit connection port (G1/2 internal thread, 1/2NPT internal thread).

■ Use cable with an outer diameter between 7 and 12 mm. If a pressure-resistant packing type cable adaptor is used, only use a packing that matches the outer diameter of the cable.

■ We recommend the use of M4 screw size crimp-on terminals with an insulating sleeve.

■ The maximum cable length is 1500 meters.

⚠CAUTION
Avoid installing cables near noise-making devices such as large capacity transformers and motors. Do not lay signal/control cables in the same tray or duct with noisy switching power cables.

Note) To prevent entry of water and damage to electrical wires, the use of metal conduits and wiring ducts is recommended.

Electrical wiring procedure

Step	Procedure
1	Unscrew 4 screws and remove the cover. *Note) Be careful not to scratch painted surfaces with tools at this time.*
2	Remove blind plugs according to how the wiring for the SVX will be performed.
3	Insert cables into the conduit connection. Strip and attach the appropriate wires to the terminals, checking for polarity. Crimp contacts with insulated sleeves are recommended. *Note) Be careful not to damage the cable sheath at this time.*
4	Tighten the terminal screws fully, to a torque of 1.5 N•m (15 kgf•cm).
5	Apply adequate waterproofing measures to the conduits to prevent the entry of rainwater or water from any other source. *Note) We recommend the use of silicon resin based non-hardening seal materials.*
6	Screw 4 screws onto the SVX until it is hand-tight. *Note) Be careful not to scratch painted surfaces with tools at this time.*

Chapter 3. Operation

3-1. Auto-setup

Auto-setup is a unique program for automatically making various positioner adjustments.

After installing your SVX, auto-setup should be performed. The built-in zero and span adjustment switches on the SVX provides non-interactive closed and open valve position setting.

There are three ways to perform Auto-Setup.

■ Using the Switch.

■ Using the Field Communication Software (model CFS100)

Refer to the operation manual for Smart Valve Positioner (CM2-CFS100-2010).

■ Using HART Communicator

Refer to "5-1-2: Using a HART Communicator" on page 55.

Note) After auto-setup has completed, verify valve operation by varying the input signal.

After auto-setup, the SVX is calibrated to the fully shut (zero) and fully open (span) values of the valve. If the valve is not achieving the proper relationship between its travel and the control signal of the SVX, then adjust zero or span manually.

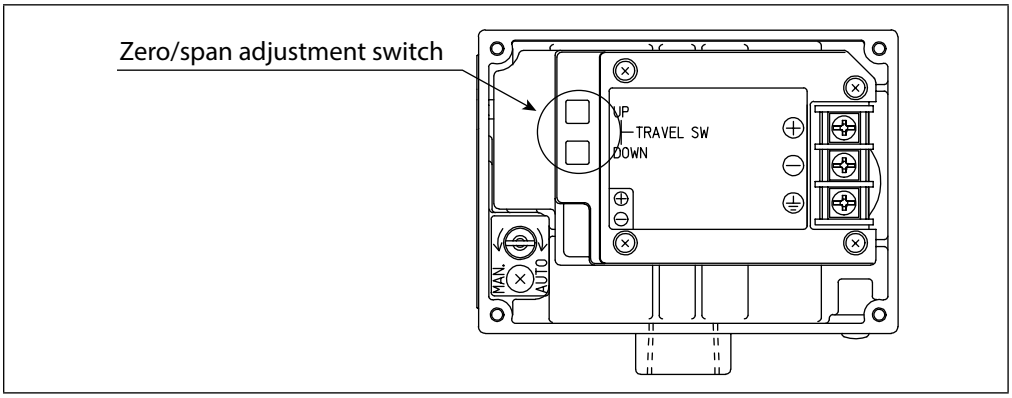


Fig. 3-1. Zero and span adjustment switch

The following valve actuator characteristics are automatically detected during autosetup:

■ Zero and span adjustment

(However, as a default, the span point is taken to be 0% of the overstroke. If a span adjustment is performed after auto-setup completes, change the overstroke value and save the changed value.)

■ Actuator operation setup

■ Lower Range Value (LRV) and Upper Range Value (URV) of input signal

If actuator operation is reverse operation: LRV = 4 mA, URV = 20 mA

If actuator operation is direct operation: LRV = 20 mA, URV = 4 mA

■ Actuator size setting

■ Hysteresis setting

⚠WARNING
While auto-setup is running, the valve cycles from open to closed. Take appropriate measures to prevent injury to personnel and adverse effects on the process.

SVX setting

If the valve action parameters set up for the SVX in Table 3-1 is the reverse values, Refer to "4-4-3: Valve system" on page 36, in this document and set the valve action to the reverse settings.

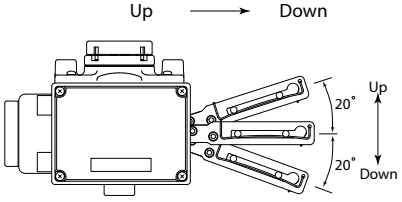
If the valve action parameters set up for the SVX in Table 3-1 is the direct values, no further parameter settings are required. (The SVX is shipped from the factory set to direct mode.)

It is recommended that auto-setup and initial calibration of your SVX be performed using the zero and span adjustment switches on the SVX.

You can also use a portable communicator to initiate auto-setup and initial calibration.

Because auto-setup and zero and span calibration must be observed for accurate valve positioning, these two steps will typically be performed by zero and span adjustment switch. Other functions including loop test, valve travel inquiry and tag number assignment require an a communicator.

Table 3-1. SVX setting

Lever	Valve Direction	Input signal	SVX Setting	
			Actuator Action	Valve Action
	Shut → Open	Direct Close: 20 mA, Open: 4 mA	Reverse	Reverse
		Reverse Close: 4 mA, Open: 20 mA	Direct	Reverse
	Open → Shut	Direct Close: 20 mA, Open: 4 mA	Direct	Direct
		Reverse Close: 4 mA, Open: 20 mA	Reverse	Direct

To initiate auto-setup using the zero and span adjustment switches

Step	Procedure
1	Set the input signal to the SVX to 18 ±1 mA DC
2	Hold the "UP" switch down until the auto-setup program starts (approx. 3 seconds) then release the "UP" switch.
3	The valve moves from fully shut to fully open twice. The valve then opens to about 50% and stays this way for up to three minutes.
4	Confirm that the auto-setup routine is complete by varying the input signals. The entire auto-setup procedure should take about three minutes.
5	If the input signal drops below 4 mA while auto-setup is running, then auto-setup will fail and must be restarted. After completing auto-setup, keep at least 4 mA of signal (power) for at least three seconds to make sure data and parameters are stored in SVX memory.

Note)

- *Do not lower the input signal (4-20 mA) to a level less than 4 mA. (The level of the signal can be set to any level in the 4-20 mA range without problem.)*
- *After the operation has completed, check valve operation by varying the input signal and verifying that the valve goes to the correct position corresponding to the signal. If the span position has shifted, perform a span adjustment operation. (Refer to "3-2: Zero and span adjustment" on page 22.)*
- *In some cases, the auto-setup routine will not properly detect your valve, especially if the valve's actuator is smaller than Azbil Corporation's HA1 type actuator (diaphragm capacity of (850 cm^3 {52 $inches^3$})) or the operation stroke is smaller than 14.3 mm {9/16 inches}. If this occurs "4-4-4: Control configuration" on page 37.*
- *There is a possibility that the forced open value "4-4-7 : Tvl cut off (Travel Cutoff)" on page 41, may change after performing the auto-setup operation. If necessary, reset the forced fully open value.*
- *If the booster relay is on, and is operating the auto-setup function, there might be a possibility of hunting. In this case, adjust the booster's sensitivity or refer to "4-4-4: Control configuration" on page 37 and adjust the dynamic characteristic manually.*
- *If PARAM0 is selected for the actuator size selection item, auto setup will be performed once from the fully closed to fully open position and back to fully closed. Also, the actuator size will not be automatically set.*
- *The "DOWN" adjustment switch is only for the auto-setup function of Azbil Corporation's model VFR. Do not use the "DOWN" adjustment switch with any other actuator.*

3-2. Zero and span adjustment

The SVX provides an zero and span adjustment function.
This method is also useful when the communicator is not available.
There are three ways to perform zero and span adjustment.

- Using the switch
- Using communicator by input signal
- Using communicator by supply air

Zero and span adjustment using the switch

Zero and span adjustments can be made pressing the “UP” or “DOWN” button switch. Once adjustments have been completed, press the button switch a second time to record the new position.

Since the zero and span adjustments do not interfere with each other, they can be adjusted independently.

■ Adjustment direction

The feedback lever moves up when the “UP” adjustment switch is pressed.

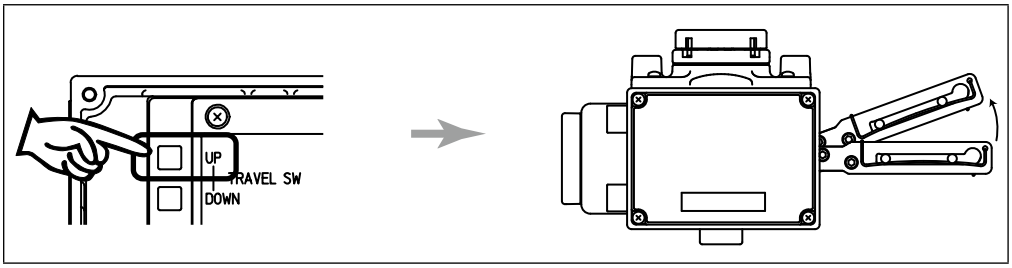


Fig. 3-2. Adjusting the lever in the upward direction

The feedback lever moves down when the “DOWN” adjustment switch is pressed.

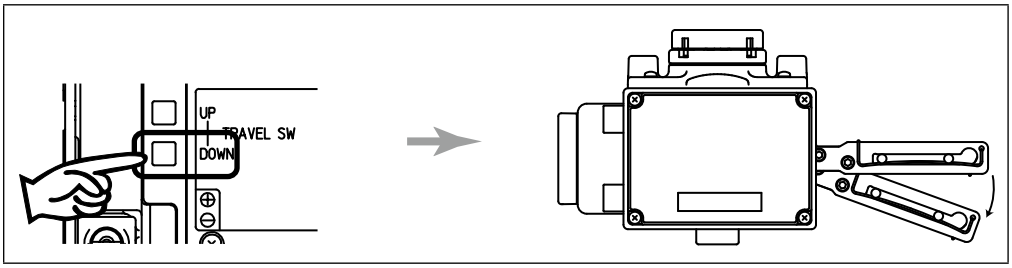


Fig. 3-3. Adjusting the lever in the downward direction

Note)

■ *The zero and span adjustment function uses the input signal to identify whether a valve fully open position (span) adjustment or a valve fully closed position (zero) adjustment is to be performed. If the input signal is not within the range of ±1 mA of the set current values that correspond to the valve open and closed position, this function will not operate.*

■ *Use the adjustment switches only if the supply air pressure is stable and only if the valve can move freely.*

Procedure to adjust valve to fully shut position (zero)

The procedure for adjusting the valve to the fully shut position (zero) is given below.

Step	Procedure
1	Input the setting current value that corresponds to the valve being fully shut from the controller (constant-current supply). (Example: 4 mA)
2	Adjust the valve fully shut position by pressing the “UP” or “DOWN” adjustment button switch. (If the forced ON/OFF function is operating, the valve will not move. To change the forced ON/OFF setting, refer to “4-4-7 : Tvl cut off (Travel Cutoff)” on page 41. The default value is set to 0.5%.)

Procedure to adjust valve to fully open position (span)

The procedure for adjusting the valve to the fully open position (span) is given below.

Step	Procedure
1	Input the setting current value that corresponds to the valve being fully open from the controller (constant-current supply). (Example: 20 mA)
2	Adjust the valve fully open position by pressing the “UP” or “DOWN” adjustment button switch. The default value is set to 99%.

Note)

- *After completing the valve fully open and fully closed position (zero and span) adjustments, check valve operation by varying the input signal and verifying that the valve goes to the correct position corresponding to the signal.*
- *After completing the adjustments, hold the input signal at a level over 4 mA for at least 3 seconds to write the set positions.*
- *When adjusting the span after the auto-setup, the forced fully open value (refer to “4-4-7 : Tvl cut off (Travel Cutoff)” on page 41) will automatically set to -1% of the overstroke. Reset the fully open value if necessary.*

3-3. Starting operation

Items to verify before setup

Before setting up for this adjustment, verify the following.

- The air supply system has been completed and the air supply pressure required by the actuator is being supplied. (Refer to " Connecting the Air Supply" on page 13.)
- Connection with the Field Communication Software (model CFS100) has been completed.
- The SVX and the communicator are communicating.

Verifying SVX operation

The procedure for verifying SVX operation is given below.

Step	Procedure
1	Vary the input signal from the controller (constant-current supply) and verify that the position of the control valve changes according to the set characteristics. If the system does not operate correctly, Refer to "Chapter 5: Maintenance and Troubleshooting" on page 55
2	If the system does operate correctly, restore the electrical wiring to its original state and tighten down the cover firmly. (Refer to "2-3: Electrical wiring" on page 17)

Operation startup procedure

The SVX and the control valve form a manipulator used in process control. Always observe adequate safety precautions when starting control valve operation using the SVX.

Note) Pay particular attention to how well electrical connection components (adapters, blind plugs, and similar equipment) are tightened down, and to how well covers are tightened down as well. Verify the following points before starting operation.

The verification procedure is given below.

Step	Procedure
1	Verify that the SVX is installed correctly. Verify that nothing interferes when the control valve operates.
2	Verify that the SVX electrical wiring is installed and connected securely. Also verify that the air lines are installed and connected securely and that there are no air leaks.
3	Verify that the valve operates as set up according to the input signal.

After the above items have been checked, operation of the SVX and control valve may be started.

Stopping operation

The procedure for stopping operation is given below.

Step	Procedure
1	Stop operation of the process. (Move each valve to the air fail position.)
2	Turn off the input signal (power supply) to the SVX.
3	Turn of the air supply to the SVX. *Note) If the SVX is installed in an adverse environment, for example, in a corrosive atmosphere, we recommend not turning off the air supply to prevent corrosive gasses from entering the SVX.*

Chapter 4. Communication-Based Operation

Overview of this chapter

This chapter describes operations that are performed using communication.

Refer to this chapter for information regarding the basics of operations, the relationship between modes and data settings, data setting and modification, the saving of various types of data, etc.

4-1. Starting Communication

Before starting communication

Confirm the following points before starting communication.

■ Electrical wiring of the device is completed (see the "Wiring method" below).

■ There is an input signal from the controller (constant-current supply).

Note) If there is no 4 to 20 mA DC signal from the controller, connect a constant-current supply (3.85 to 21.5 mA DC) to the input signal terminal. When doing so, be sure to remove the wires coming from the controller off of the terminals.

4-1-1. Wiring method

Introduction

The wiring method for communicating with this device will now be described.

■ With HART® communication

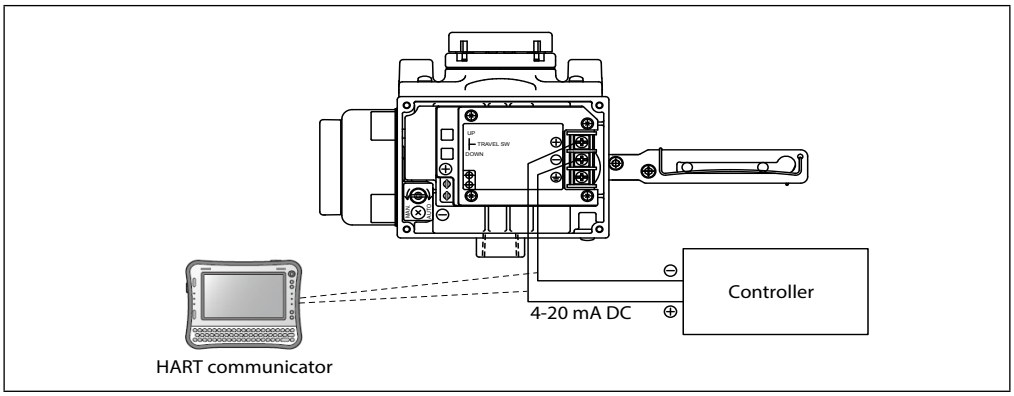


Fig. 4-1. Wiring of HART® Communication Tool (Model SVX102)

■ With SFN communication

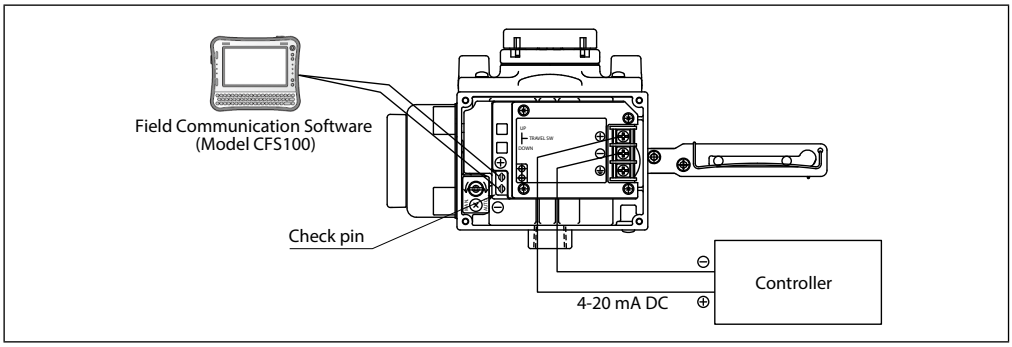


Fig. 4-2. Wiring with Field Communication Software (Model SVX100/102)

4-2. Communication-Based Operation

Operations such as adjustment and configuration of the device and reading on the device will now be described with reference to the menus of the Field Communication Software (model CFS100). Regarding operating methods, see *Field Communication Software Model: CFS100 Instruction Manual (Smart Valve Positioner Edition)* (No. CM2-CFS100-2010).

By communicating with this device, the following can be performed.

■ 4.3 Operation Data Confirmation

4.3.1 Measured value confirmation

4.3.2 Adjustment data confirmation

■ 4.4 Device Configuration and Adjustment

4.4.1 Auto-setup

4.4.2 Zero/span adjustment

4.4.3 Control valve system configuration

4.4.4 Control parameter configuration

4.4.5 Input signal range configuration

4.4.6 Flow rate characteristics configuration

4.4.7 Forced fully open/closed setting

■ 4.5 Device Information Confirmation and Modification

4.5.1 Device information/production number confirmation and modification

4.5.2 Device software revision information confirmation

■ 4.6 Maintenance

4.6.1 Mode modification

4.6.2 Input signal calibration

4.6.3 Dummy input signal

4.6.4 Dummy EPM drive signal

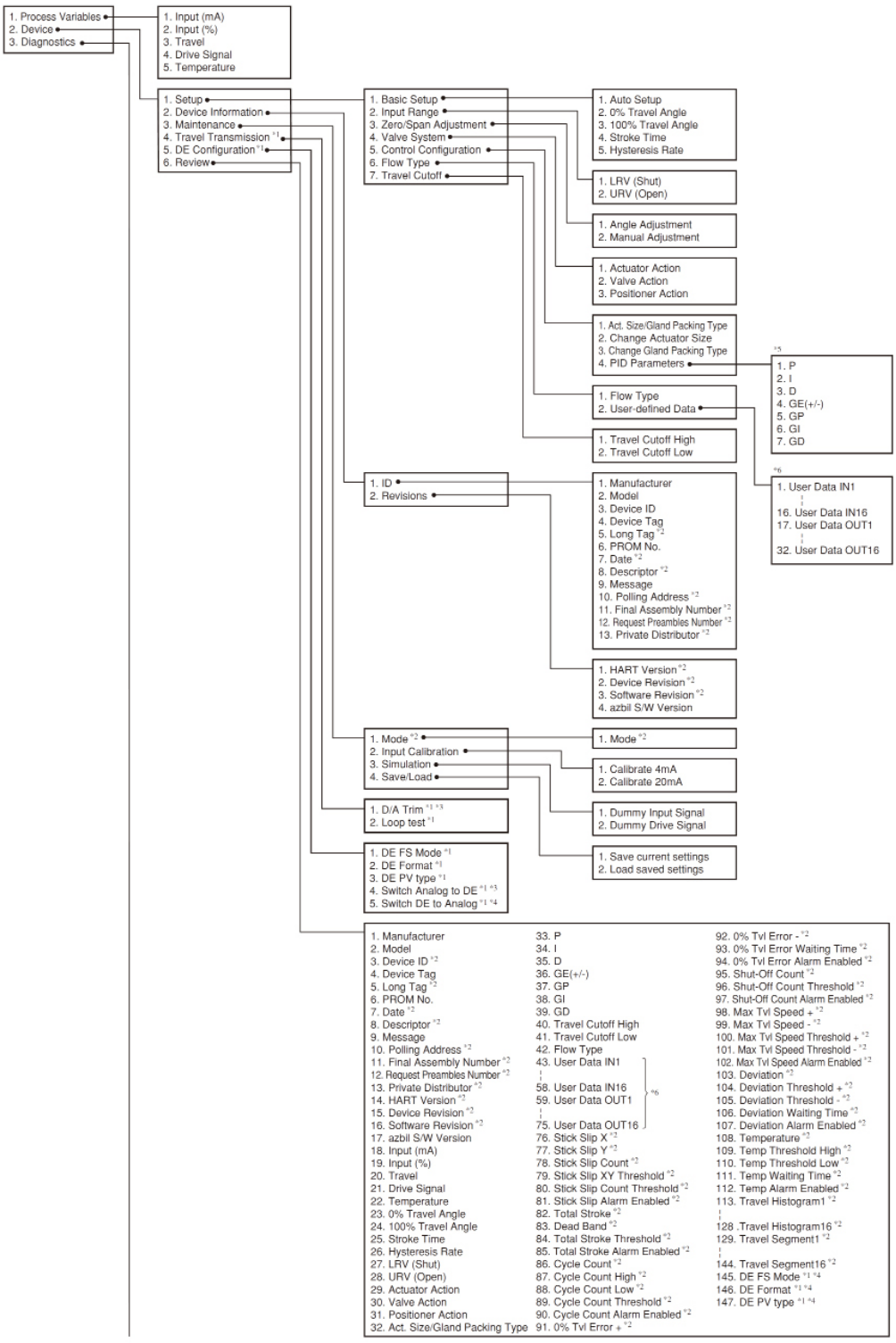
4.6.5 Configuration data saving

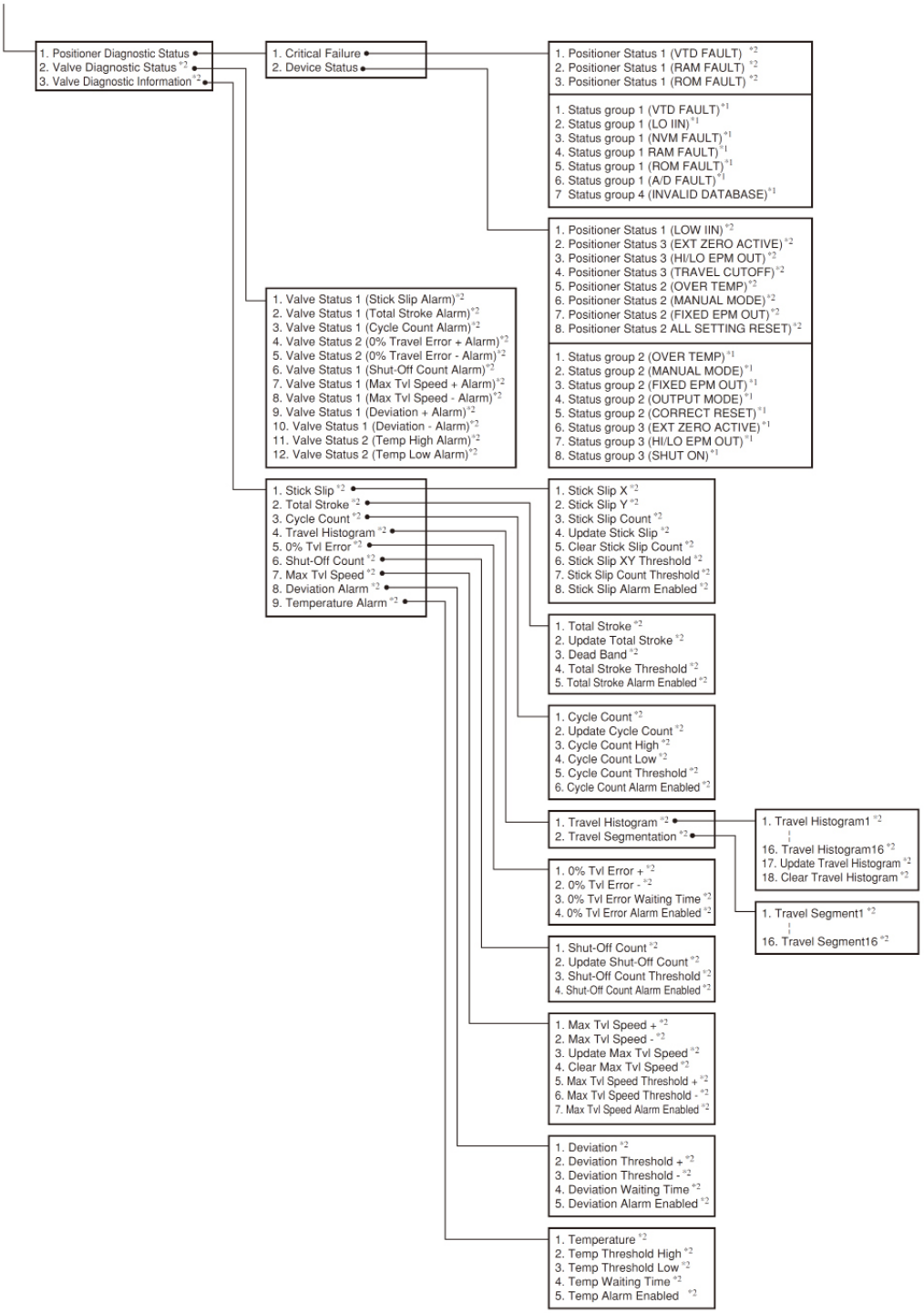
4.6.6 Saved configuration data retrieval

■ 4.7 Valve Diagnostic Parameter Configuration

■ 4.8 Self-diagnostics

4-2-1. Menu Tree





*1. Not displayed on the HART® version. *2. Not displayed on the SFN version.*

*3. Not displayed when DE communication selected. *4. Enabled when DE communication selected (not shown).*

*5. Displayed when "Actuator Size" is "Param0." *6. Displayed when "Flow Type" is "User-defined."*

Versions

This chapter describes the functions of the following versions.

[Model SVX100]

Azbil software version: 3.5 or later

[Model SVX102]

HART® Version 6

Device revision: 1

Software revision: 1 or later

Azbil software version: 6.1 or later

4-3. Operation Data Confirmation

Allows confirmation of measured values and adjustment data for the operating state of the device.

The following items can be checked.

4-3-1. Measured value confirmation

Select [Process Variables]. You will be able to check the following items.

(1) Input (mA)

Displays the electric current input value.

(2) Input (%)

Displays the input signal (%).

(3) Travel

Displays the valve position (%).

(4) Drive Signal

Displays the EPM (electro-pneumatic module) drive signal (%).

(5) Temperature

Displays the positioner internal temperature (°C).

4-3-2. Adjustment data confirmation

Select [Device] >> [Setup] >> [Basic Setup]. You will be able to check the following items.

(1) 0 % Travel Angle

Displays the angle specified as the valve fully closed point.

(2) 100 % Travel Angle

Displays the angle specified as the valve fully open point.

(3) Stroke Time

Displays the valve full stroke time that was measured when auto-setup was executed.

(4) Hysteresis Rate

Displays the friction level of the gland packing that was measured when auto-setup was executed.

4-4. Device Configuration and Adjustment

In device configuration and adjustment, the configuration and adjustment that are necessary for this device to operate properly are performed. For the HART® version, first set the mode of the device to "Out of service."

Select [Device] >> [Maintenance] >> [Mode] >> [Mode]. You will be able to change the mode.

Note) For the HART® version, when finished performing adjustment and configuration, set the mode to "In service."

4-4-1. Auto-setup

Use auto-setup for the following items.

(1) Zero/span adjustment
(2) Actuator action direction configuration
(3) Input signal LRV and URV configuration
(4) Actuator size selection
(5) Hysteresis difference selection
(6) Travel transmission fail safe selection

⚠WARNING
• During auto-setup, the valve moves from fully open. Take appropriate measures beforehand to ensure that the movement of the valve will not cause injury or have an effect on the process.

step	Procedure
1	Confirm that the input signal is 4 mA or higher.
2	Select [Device] >> [Setup] >> [Basic Setup] >> [Auto Setup] to execute the method.
3	Following the screen display, execute the operation. The control valve will start to move. This operation takes about two to three minutes.
4	When the operation ends, "Auto Setup is Completed" is displayed on the screen. When control via the input signal becomes possible, auto-setup ends.
5	Vary the input signal and check the movement to confirm that adjustment is being performed appropriately.

4-4-2. Zero/span adjustment

[Valve fully closed position configuration]

The procedure for setting the valve fully closed position is shown below.

step	Procedure
1	Select [Device] >> [Setup] >> [Zero/Span Adjustment] >> [Angle Adjustment] >> [Zero].
2	Input the input signal that is to fully close the valve.
3	If the forced fully closed setting (travel cutoff low) is 0 % (default value + 0.5 %) or higher, the screen for configuring the travel cutoff low will appear. Set it to 0 % or lower.
4	From the [Zero Adjustment] menu, select a combination of the angle size and the increment or decrement for which to perform the adjustment. To increment by 0.03°, select [Increment/0.03].
5	Perform zero adjustment by carrying out step 4 above multiple times.
6	When adjustment is complete, select [Exit] on the [Zero Adjustment] menu.
7	The screen for the forced fully closed setting will appear. If you have already modified this value, return to the original value.
8	Select [Exit] from the [Zero/Span Adjustment] menu.

[Valve fully open position configuration]

The procedure for setting the valve fully closed position is shown below.

step	Procedure
1	Select [Device] >> [Setup] >> [Zero/Span Adjustment] >> [Angle Adjustment] >> [Span].
2	Input the input signal that is to fully open the valve.
3	From the [Span Adjustment] menu, select a combination of the angle size and the increment or decrement for which to perform the adjustment. To decrement by 0.03°, select [Decrement/0.03].
4	Perform span adjustment by carrying out step 3 above multiple times.
5	When adjustment is complete, select [Exit] on the [Span Adjustment] menu.
6	The screen for setting the forced fully open value will appear. Set it if necessary. (Normally, this will not need to be set.)
7	Select [Exit] from the [Zero/Span Adjustment] menu.

4-4-3. Valve system

Configures the control valve control system.

Actuator action, valve action, and positioner action are set and modified here.

Actuator action

Select [Direct] or [Reverse]. If the feedback lever moves downward in response to increasing air pressure to the actuator, set this to [Direct]; if the feedback lever moves upward, set this to [Reverse]. (This will be set automatically if auto-setup is performed.)

The procedure for configuring actuator action is shown below.

step	Procedure
1	Select [Device] >> [Setup] >> [Valve System] >> [Actuator Action].
2	Specify [Direct] or [Reverse] actuator action.
3	Send the modified setting to the device using the transmission button.

Valve action

Select [Direct] or [Reverse]. If the feedback lever moves downward when the control valve moves in the direction from open to closed, set this to [Direct]; if the feedback lever moves upward, set this to [Reverse].

The procedure for configuring valve action is shown below.

step	Procedure
1	Select [Device] >> [Setup] >> [Valve System] >> [Valve Action].
2	Specify [Direct] or [Reverse] valve action.
3	Send the modified setting to the device using the transmission button.

Positioner action

Select [Direct] or [Reverse]. To make the device's output air pressure go to zero when the power supply is cut off, set this to [Direct]; to make the output air pressure go to the maximum level, set this to [Reverse].

Note) Modifying the positioner action requires EPM (electro-pneumatic module) reconfiguration. Reconfiguration should be performed by an Azbil Corp. service representative.

The procedure for configuring positioner action is shown below.

step	Procedure
1	Select [Device] >> [Setup] >> [Valve System] >> [Positioner Action].
2	Specify [Direct] or [Reverse] positioner action.
3	Send the modified setting to the device using the transmission button.

4-4-4. Control configuration

For the device's dynamic characteristics, the PID parameters are selected based on the combination of actuator size and gland packing type.

Actuator size

Select the actuator size from parameters 0 to 9, A, B, and C (Param 0 to 9, A, B, and C). (This is selected automatically when auto-setup is executed.)

If auto setup cannot be executed or the desired parameter cannot be set by auto setup, see the table below to select a PARAM that is suitable for the installed actuator.

Table 4-1. Actuator Size Parameter Table

Actuator Size (ACTUATOR SIZE)	Operating Speed [s]	Typical Actuator Type	Actuator Capacity (Typical Value) [cm^3]
PARAM C	to 0.58	—	—
PARAM B	to 0.8	—	—
PARAM A	to 1.02	—	—
PARAM 1	to 1.5	PSA1, PSK1	600
PARAM 2	to 3	PSA2, HA2	1,400
PARAM 3	to 6.6	PSA3, HA3	2,700
PARAM 4	to 12	PSA4, HA4	6,600
PARAM 5	to 99	VA5	25,300
PARAM 6	to 20	VA6, PSA6	8,100
PARAM 7	to 1.9	RSA1	760
PARAM 8	to 4.3	RSA2	3,800
PARAM 9	to 99	VR3, VR3H	5,800
PARAM 0	—	—	Set individually*

** Consult with Azbil Corporation service personnel.*

Actuator size configuration procedure

step	Procedure
1	Select [Device] >> [Setup] >> [Control Configuration] >> [Act. Size/Gland Packing Type], and check the current setting.
2	Select [Device] >> [Setup] >> [Control Configuration] >> [Change Actuator Size], and select from parameters 0 to 9, A, B, and C. If parameter 0 has been selected, the gap action type PID parameters can be set individually. (Parameters 7 to 9 are specifically for the Azbil Corporation VFR control valve RSA/VR actuator.)

Gland packing type

For the hysteresis difference due to friction of the control valve gland packing, select from [Heavy], [Medium] and [Light]. (This is selected automatically when autosetup is executed.) Regarding the types of gland packing, see Table 4-2 below.

Table 4-2. Gland Packing Type Parameter Table

Hysteresis* (HYSTERESIS)	Gland packing material example
Heavy (HEAVY)	Graphite packing
Medium (MEDIUM)	Yarn packing
Light (LIGHT)	V type PTFE packing

* *This cannot be decided on the basis of material because it depends on the frictional force of the gland packing.*

Gland packing type configuration procedure

step	Procedure
1	Select [Device] >> [Setup] >> [Control Configuration] >> [Act. Size/Gland Packing Type], and check the current setting. If the actuator size is 0, A, B, or C, the gland packing type is not displayed.
2	Select [Device] >> [Setup] >> [Control Configuration] >> [Change Gland Packing Type], and select [Light], [Medium], or [Heavy].

Gap PID parameters

For actuator size, if parameter 0 has been selected, the gap operation type PID parameters can be set individually. The gap action PID method is utilized as the dynamic characteristics algorithm for this device. In the gap action type PID method, deviation values (the gap) above and below the set-point value are set up, and the PID parameters are changed depending on whether the process value is inside or outside the gap. The merits of this method are that it is relatively simple to tune and that it enables both fast response and stability. The meaning of each parameter is described below.

Table 4-3. Gap Action Type PID Parameters

Parameter	Parameter Meaning	Units
P	Reciprocal of the in-gap proportional band	$\%^{-1}$
I	Inside-gap integrated time	s
D	Inside-gap differentiated time	s
GE	Gap width	%
GP	Reciprocal of the out-of-gap proportional band	$\%^{-1}$
GI	Outside-gap integrated time	s
GD	Outside-gap differentiated time	s

Example:

P = 2.000 indicates that 2 $\%^{-1} = \frac{1}{0.02}$ % = 50 %.

This means using 50 % as the proportional band, as it is commonly called.

Note) The input setting range for these values is −19999 to +19999.

The GP, GI, and GD parameters cannot be set when GE is 0.

Gap PID parameter configuration procedure

step	Procedure
1	Select [Device] >> [Setup] >> [Control Configuration] >> [Change Actuator Size], and set the actuator size to the parameter 0. The PID parameters will be displayed.
2	Select [Device] >> [Setup] >> [Control Configuration] >> [PID Parameter]. You will be able to check or modify seven PID parameters (P, I, D, GE, GP, GI, and GD).
3	Enter values to set the seven respective PIDs. For the SFN version, start the method and enter the values in order.
4	For the HART® version, send the modified setting to the device using the transmission button.

4-4-5. Input range

This procedure sets the electric current input value when the valve is fully closed (LRV) and the electric current input value when the valve is fully open (URV). Values can be entered in the 4 to 20 mA range. A split range can be specified as well.

Note) Set these values so that the electric current input span (the difference between LRV and URV) is in the 4 to 16 mA range.

If the span is 8 mA or less, the accuracy will be 1.5 % of full scale.

Input range configuration procedure

The procedure for setting the desired electric current input values is shown below.

Configuration procedure for electric current input values (mA) for valve fully closed

step	Procedure
1	Select [Device] >> [Setup] >> [Input Range].
2	Select [LRV (Shut)], and enter the electric current input value when the valve is fully closed.
3	Send the modified setting to the device using the transmission button.

Configuration procedure for electric current input values (mA) for valve fully open (100 % position)

step	Procedure
1	Select [Device] >> [Setup] >> [Input Range].
2	Select [URV (Open)], and enter the electric current input value when the valve is fully open (when the position is 100 %).
3	Send the modified setting to the device using the transmission button.

4-4-6. Flow Type

This function sets, from among four types of flow rate characteristics, the relationship between the input signal and the position. A sketch of the four characteristics (linear, equal percent, quick open, and user-defined) is shown below.

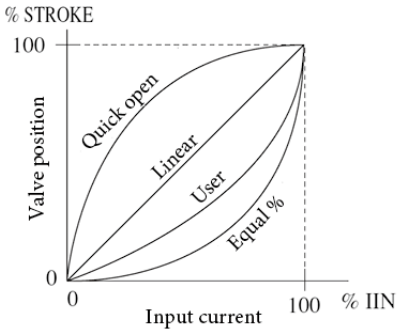


Fig. 4-4. Flow Characteristics Overview

Note) If this has been set to user-defined, the flow rate characteristics conversion data can (must) be specified.

Flow Type configuration procedure

step	Procedure
1	Select [Device] >> [Setup] >> [Flow Type].
2	Select from [Linear], [Equal Percent], [Quick Open], and [User-defined]. If [User-defined] has been selected, specify the flow rate characteristics conversion data [User-defined Data].
3	Send the modified setting to the device using the transmission button.

User-defined Data

This function sets user-defined flow rate characteristics conversion data. There are 16 data points for input and 16 for output. For each point, specify an input signal (User Data IN1–16) and an output signal (User Data OUT1–16). The characteristics will be the result of connecting the 16 points with straight lines.

Note) Input all 16 points (input signal and position).

Specify the input values in order from smallest to largest.

Specify the values such that the characteristics increase monotonically.

User-defined data configuration procedure

step	Procedure
1	For [Device] >> [Setup] >> [Flow Type], select [User-defined].
2	Select [User-defined], and enter all parameters User Data IN1–16 and User Data OUT1–16.
3	Send the modified setting to the device using the transmission button.

4-4-7. Travel Cutoff

Sets the input signal values (%) that force the valve fully open and fully closed. The valve will be fully closed at input values less than the forced fully closed value, and will be fully open at input values greater than the forced fully open value. The input signal values (%) for the valve forced fully open and fully closed are set independently. An overview of the input/output characteristics when forced fully closed/open values have been set is shown below.

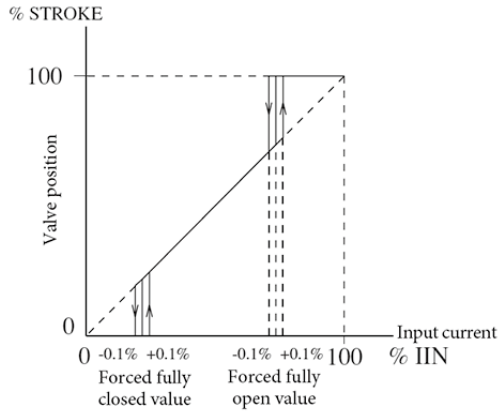


Fig. 4-5. Forced Fully Open/Closed Settings

Note)

- *Set these parameters such that the forced fully open setting (Travel Cutoff High) is greater than the forced fully closed setting (Travel Cutoff Low).*
- *If a span adjustment is performed after auto-setup has been executed, the forced fully open setting will be 1 % less than the overstroke percentage.*
- *The forced fully open and forced fully closed settings have a hysteresis difference of 0.1 %*
- *As a result of configuring the forced fully closed setting, the control valve can become fully closed when the input signal drops to the preset value or lower, so set the output limiter (Lo) on the host to −1 % or higher.*

Travel Cutoff Low configuration procedure

step	Procedure
1	Select [Device] >> [Setup] >> [Travel Cutoff] >> [Travel Cutoff Low].
2	Specify the input signal value at which to force the valve fully closed.
3	Send the modified setting to the device using the transmission button.

Travel Cutoff High configuration procedure

step	Procedure
1	Select [Device] >> [Setup] >> [Travel Cutoff] >> [Travel Cutoff High].
2	Specify the input signal value at which to force the valve fully open.
3	Send the modified setting to the device using the transmission button.

4-5. Device Information Confirmation and Modification

Allows confirmation and modification of device information.

4-5-1. Device information/production number confirmation and modification

Select [Device] >> [Device Information] >> [ID]. You will be able to check or modify the following items.

(1) Manufacturer

Displays the manufacturer of the device. “Azbil Corporation” is displayed.

(2) Model

Displays the name and model number of the device. “SVP-V2” is displayed.

(3) Device ID (HART® version only)

Displays device-specific information.

(4) Device Tag

Displays and allows modification of the tag number assigned to the device.

(5) Long Tag (HART® version only)

Displays and allows modification of the long tag number assigned to the device.

(6) PROM No.

Displays ID information.

(7) Date (HART® version only)

Displays and allows modification of specific dates such as the last configuration date for the device.

(8) Descriptor (HART® version only)

Displays and allows modification of information required to manage the device.

(9) Message

Displays and allows modification of messages registered to the device.

(10) Polling Address (HART® version only)

Displays and allows modification of the address of the device. When multiple devices are connected to the same loop, indicates device addresses (split range, multidrop connection, and the like).

(11) Final Assembly Number (HART® version only)

Displays and allows modification of specific management numbers such as the last configuration date for the device and system.

(12) Request Preambles Number (HART® version only)

Displays the number of preambles that the device requests from the host.

(13) Private Distributor (HART® version only)

Displays the name of the distributor of the device.

4-5-2. Device software revision information confirmation

Select [Device] >> [Device Information] >> [Revisions]. You will be able to check the following items.

(1) HART® Version (HART® version only)

Displays the revision number of the HART® universal commands supported by model SVX102.

(2) Device Revision (HART® version only)

Displays the revision number of the device-specific commands supported by model SVX102.

(3) Software Revision (HART® version only)

Displays the revision number of the software in the same device revision.

(4) Azbil Software Version

Displays the software revision number. This is Azbil Corporation's internal management number, and has a one-to-one correspondence with the software revision above.

4-6. Maintenance

4-6-1. Mode

The HART® version has two modes. One is “In service” and the other is “Out of service.”

When performing calibration or adjustment, or when changing settings, the control valve will move, so first verify that these operations will not result in problems that could adversely affect plant operation. Then set the mode to “Out of service.”

After completing calibration or adjustment, or after changing settings, set the mode to “In service.” These operations cannot be performed when the device mode is “In service.”

Mode modification procedure

step	Procedure
1	Select [Device] >> [Maintenance] >> [Mode]
2	Select [Out of Service] or [In Service].
3	Send the modified setting to the device using the transmission button.

4-6-2. Input calibration

Calibrates the difference between the electric current input of 4 mA (or 20 mA) from the controller and the input signal of 4 mA (or 20 mA) perceived by the device.

4 mA electric current input calibration procedure

step	Procedure
1	Select [Device] >> [Maintenance] >> [Input Calibration] >> [Calibrate 4 mA].
2	Set the electric current input (controller output) to 4 mA.
3	The electric current input value perceived by the device will be displayed on the screen. If that value is satisfactory for performing calibration, click [OK].
4	After a while, calibration will end, and then the input signal value will be displayed. Check whether it is correctly configured.

20 mA electric current input calibration procedure

step	Procedure
1	Select [Device] >> [Maintenance] >> [Input Calibration] >> [Calibrate 20 mA].
2	Set the electric current input (controller output) to 20 mA.
3	The electric current input value perceived by the device will be displayed on the screen. If that value is satisfactory for performing calibration, click [OK].
4	After a while, calibration will end, and then the input signal value will be displayed. Check whether it is correctly configured.

4-6-3. Dummy input signal

Sets the input signal via communication, regardless of the value of the input signal from the controller. This function can be effective when, for instance, isolating problems during troubleshooting. For example, if the control valve does not move in response to input signals from the controller, but the valve operates correctly in response to the simulated current input, it follows that the problem is somewhere between the wiring and the host system.

Dummy input signal configuration procedure

step	Procedure
1	Select [Device] >> [Maintenance] >> [Simulation] >> [Dummy Input Signal].
2	Select a dummy input signal ([0 %], [50 %], [100 %], or [Other]) from the [Dummy Input Signal] menu.
3	If you selected [Other], enter a value (0 to 100 %).
4	To cancel the dummy input signal, select [Clear] from the [Dummy Input Signal] menu.
5	To exit the [Dummy Input Signal] menu, select [Exit].

4-6-4. Dummy Drive Signal

Cuts off the drive signal from the PID control unit, and applies the dummy drive signal to the EPM (electro-pneumatic module).

Dummy Drive Signal configuration procedure

step	Procedure
1	Select [Device] >> [Maintenance] >> [Simulation] >> [Dummy Drive Signal].
2	Select a dummy EPM drive signal ([0 %], [50 %], [100 %], or [Other]) from the [Dummy Drive Signal] menu.
3	If you selected [Other], enter a value (0 to 100 %).
4	To cancel the dummy EPM drive signal, select [Clear] from the [Dummy Drive Signal] menu.
5	To exit the [Dummy Drive Signal] menu, select [Exit].

4-6-5. Save Current Settings

Saves all of the device's internal data (settings) in place of the factory shipment data specifications (the data that was set based on the model number).

Use the "Load saved settings" operation to retrieve the saved data.

We recommend saving the configuration data after the device has been installed and all configuration has been completed.

Save current settings procedure

step	Procedure
1	Select [Device] >> [Maintenance] >> [Save/Load] >> [Save current settings] to execute the command.
2	When the data is saved, "Save current settings was completed" is displayed.

4-6-6. Load saved settings

Returns all of the device's internal data settings to the settings at the time of shipping.

This is useful when for instance installing the device on a different control valve.

- If this function is executed, the settings for valve fully open and valve fully closed (zero/span adjustment) will also be reset to the settings at the time of shipment. Overwrite these settings again the next time the device is used.
- If "Save Current Settings" in the configuration settings was executed before this function, the internal data saved at that time will be restored.

Load saved settings procedure

step	Procedure
1	Select [Device] >> [Maintenance] >> [Save/Load] >> [Load saved settings] to execute the command.
2	When the data has been retrieved, "Load saved settings is completed" is displayed.

4-7. Valve Diagnostic Parameter Configuration

Performs configuration necessary for valve diagnostics.

4-7-1. Stick-Slip

A stick-slip value quantitatively represents abnormal valve movements caused by adhesion, seizing, and the like. Select [Diagnostics] >> [Valve Diagnostic Information] >> [Stick Slip]. You will be able to check or modify the following items. To change a value, select the item and then change it.

Stick-Slip X

Displays the Stick Slip X value.

Stick-Slip Y

Displays the Stick Slip Y value.

Stick-Slip Count

Displays the Stick Slip Count.

Update Stick Slip

Updates the Stick Slip X value, Stick Slip Y value, and Stick Slip Count to the most recent values.

■ Select the [Update Stick Slip] menu to execute the update.

Clear Stick Slip Count

Resets the count to zero.

■ Select the [Clear Stick Slip Count] menu to reset the count.

Stick Slip XY Threshold

Displays and allows modification of the XY threshold. This is the value which, when reached or exceeded by the stick-slip value (Stick Slip Y divided by Stick Slip X), results in incrementation of the count. (An alarm is not activated merely as a result of this value being exceeded, but an alarm is activated if the count threshold is exceeded.)

Stick Slip Count Threshold

Displays and allows modification of the count threshold value. An alarm occurs if the number of times the XY threshold is exceeded reaches or exceeds this value.

Stick Slip Alarm Enabled

Displays and allows modification of the alarm enabled/disabled status. If the status is Enabled, alarms will occur, and if the status is Disabled, alarms will not occur.

4-7-2. Total Stroke

This value is the result of totaling the distances (%, mm) that the valve moved.

Select [Diagnostics] >> [Valve Diagnostic Information] >> [Total Stroke]. You will be able to check or modify the following items. To change a value, select the item and then change it.

Total Stroke

Displays and allows modification of the total stroke value.

Update Total Stroke

Updates the total stroke distance to the latest value.

■ Select the [Update Total Stroke] menu to execute the update.

Dead Band

Displays and allows modification of the dead band. The dead band is the minimum position width [± %FS] for calculating the total stroke distance.

Total Stroke Threshold

Displays and allows modification of the threshold. An alarm occurs if the stroke distance reaches or exceeds this value.

Total Stroke Alarm Enabled

Displays and allows modification of the alarm enabled/disabled status. If the status is Enabled, alarms will occur, and if the status is Disabled, alarms will not occur.

4-7-3. Cycle Count

Counts the total number of times that the valve position reverses after at least the specified amount of valve travel.

Select [Diagnostics] >> [Valve Diagnostic Information] >> [Cycle Count]. You will be able to check or modify the following items. To change a value, select the item and then change it.

Cycle Count

Displays and allows modification of the motion reversal count.

Update Cycle Count

Updates the reversal count to the latest value.

■ Select the [Update Cycle Count] menu to execute the update.

Cycle Count High, Cycle Count Low

Displays and allows modification of the upper and lower threshold values for position width.

Cycle Count Threshold

Displays and allows modification of the threshold. An alarm occurs if the reversal count reaches or exceeds this value.

Cycle Count Alarm Enabled

Displays and allows modification of the alarm enabled/disabled status. If the status is Enabled, alarms will occur, and if the status is Disabled, alarms will not occur.

4-7-4. Travel Histogram

Indicates how frequently the valve travels in the specified position ranges, as a proportion of the total travel time.

[Travel Histogram]

Select [Diagnostics] >> [Valve Diagnostic Information] >> [Travel Histogram] >> [Travel Histogram]. You will be able to check the following items.

Travel Histogram 1 to Travel Histogram 16

Displays the frequency of the specified position region as a percentage.

Update Travel Histogram

Updates per-position frequency distribution values 1 to 16 to the latest values.

■ Select the [Update Travel Histogram] menu to execute the update.

Clear Travel Histogram

Deletes the per-position frequency distribution values.

■ Select the [Clear Travel Histogram] menu to delete the values.

[Travel Segmentation]

Select [Diagnostics] >> [Valve Diagnostic Information] >> [Travel Histogram] >> [Travel Segmentation]. You will be able to check or modify the following item.

Travel Segmentation 1 to Travel Segmentation 16

Displays and allows modification of the 15 position regions for the 16 positions.

4-7-5. 0 % Travel Error

When the valve is fully closed, the zero point from when zero adjustment was performed is compared to the current zero point, and an alarm occurs if the discrepancy between them is greater than or equal to a specified deviation and if this discrepancy persists for longer than the specified time.

Select [Diagnostics] >> [Valve Diagnostic Information] >> [0 % Travel Error]. You will be able to check or modify the following items. To change a value, select the item and then change it.

0 % Tvl Error +, 0 % Tvl Error –

Displays and allows modification of the deviation on the "+" side and "–" side.

0 % Tvl Error Waiting Time

Displays and allows modification of the waiting time. An alarm occurs if the deviation continues for longer than this waiting time.

0 % Tvl Error Alarm Enabled

Displays and allows modification of the alarm enabled/disabled status. If the status is Enabled, alarms will occur, and if the status is Disabled, alarms will not occur.

4-7-6. Shut-Off Count

Counts the total number of times that the valve is fully closed.

Select [Diagnostics] >> [Valve Diagnostic Information] >> [Shut-Off Count]. You will be able to check or modify the following items. To change a value, select the item and then change it.

Shut-Off Count

Displays and allows modification of the total fully closed count.

Update Shut-Off Count

Updates the fully closed count to the latest value.

■ Select the [Update Shut-Off Count] menu to execute the update.

Shut-Off Count Threshold

Displays and allows modification of the threshold. An alarm occurs if the fully closed count reaches or exceeds this value.

Shut-Off Count Alarm Enabled

Displays and allows modification of the alarm enabled/disabled status. If the status is Enabled, alarms will occur, and if the status is Disabled, alarms will not occur.

4-7-7. Max Travel Speed

The maximum operating speed per unit time of the valve.

Select [Diagnostics] >> [Valve Diagnostic Information] >> [Max Travel Speed]. You will be able to check or modify the following items. To change a value, select the item and then change it.

Max Tvl Speed +, Max Tvl Speed –

Displays and allows modification of the maximum operating speed on the "+" side and "–" side.

Update Max Tvl Speed

Updates the maximum operating speed to the latest value.

■ Select the [Update Max Tvl Speed] menu to execute the update.

Clear Max Tvl Speed

Deletes the maximum operating speed.

■ Select the [Clear Max Tvl Speed] menu to clear the count.

Max Tvl Speed Threshold +, Max Tvl Speed Threshold –

Displays and allows modification of the thresholds on the "+" side and "–" side. An alarm occurs if the maximum operating speed is outside the range specified by the thresholds.

Max Tvl Speed Alarm Enabled

Displays and allows modification of the alarm enabled/disabled status. If the status is Enabled, alarms will occur, and if the status is Disabled, alarms will not occur.

4-7-8. Deviation Alarm

Select [Diagnostics] >> [Valve Diagnostic Information] >> [Deviation Alarm]. You will be able to check or modify the following items.

Deviation

Displays the position deviation value.

Deviation Threshold +, Deviation Threshold –

Displays and allows modification of the thresholds on the "+" side and "–" side. An alarm occurs if the position deviation exceeds this value.

Deviation Waiting Time

Displays and allows modification of the waiting time. An alarm occurs if the position deviation exceeds the threshold and this amount of time has elapsed.

Deviation Alarm Enabled

Displays and allows modification of the alarm enabled/disabled status. If the status is Enabled, alarms will occur, and if the status is Disabled, alarms will not occur.

4-7-9. Temperature Alarm

Select [Diagnostics] >> [Valve Diagnostic Information] >> [Temperature Alarm]. You will be able to check or modify the following items.

Temperature

Displays the temperature

Temp Threshold High, Temp Threshold Low

Displays and allows modification of the upper and lower thresholds. An alarm occurs if the temperature goes beyond one of these values and the waiting time has elapsed.

Temp Waiting Time

Displays and allows modification of the waiting time. An alarm occurs if the temperature goes beyond a threshold and this amount of time has elapsed.

Temp Alarm Enabled

Displays and allows modification of the alarm enabled/disabled status. If the status is Enabled, alarms will occur, and if the status is Disabled, alarms will not occur.

4-8. Self-diagnostics

This device provides a self-diagnostics function. This is useful for troubleshooting. For information regarding measures to take in response to each message, see "5-1: Troubleshooting."

4-8-1. Critical Failure

Select [Diagnostics] >> [Positioner Diagnostic Status]. You will be able to check the status conditions shown below. If the value of this item is ON, a failure was observed.

Explanation of self-diagnostics messages (major failures)

Message	Description / Cause
VTD FAULT	VTD (angle sensor) error. The feedback lever has become detached. The feedback lever has exceeded the allowable angular range. The VTD connector has become detached. (For the remote type, the cable is cut.)
RAM FAULT	RAM electrical part failure
ROM FAULT	ROM electrical part failure

4-8-2. Device Status

Select [Diagnostics] >> [Positioner Diagnostic Status] >> [Device Status]. You will be able to check the status conditions shown below. If the value of this item is ON, a failure was observed.

Explanation of self-diagnostics messages (minor failures)

Message	Description / Cause
LOW IIN	The input signal (current) is too low (3.80 mA or less)
EXT ZERO ACTIVE EXT SWITCH ACTIVE	External zero/span adjustment switch is being used.
HI/LO EPM OUT	The EPM drive signal exceeds the normal operating range.
EXT ZERO ACTIVE EXT SWITCH ACTIVE	External zero/span adjustment switch is being used.
TRAVEL CUTOFF	The valve is in the forced fully open/closed state.
OVER TEMP	The perceived internal temperature of the device is lower than −45 °C or higher than +85 °C.
FIXED EPM OUT SIMULATION MODE	A dummy input signal has been set.
MANUAL MODE SIMULATION MODE	A dummy EPM drive signal has been set.
ALL SETTINGS RESET	The adjustment data and setting data has been initialized.

4-8-3. Valve Diagnostic Status

Select [Diagnostics] >> [Valve Diagnostic Status]. You will be able to check the status conditions shown below. If the value of an item is ON, an alarm was triggered.

Status	Details
Stick Slip Alarm	The Stick Slip Alarm occurs when the valve exhibits stick and slip movement.
Total Stroke Alarm	The Total Stroke Alarm occurs when the total distance of the valve plug/stem stroke movement exceeds the threshold.
Cycle Count Alarm	The Cycle Count Alarm occurs when the number of control valve reverse operation cycles exceeds the threshold
0 % Tvl Error + Alarm	The 0 % Tvl Error + Alarm occurs when there is upward deviation between current 0 % travel angle and initial 0 % travel angle.
0 % Tvl Error − Alarm	The 0 % Tvl Error − Alarm occurs when there is downward deviation between current 0 % travel angle and initial 0 % travel angle.
Shut-Off Count Alarm	The Shut-Off Count Alarm occurs when the total number of valve closures exceeds the threshold.
Max Tvl Speed + Alarm	The Max Tvl Speed + Alarm occurs when the maximum stem movement speed in the upward direction in a day exceeds the threshold.
Max Tvl Speed − Alarm	The Max Tvl Speed − Alarm occurs when the maximum stem movement speed in the downward direction in a day exceeds the threshold.
Deviation + Alarm	The Deviation + Alarm occurs when there is a positive deviation between current travel (%) and input signal (%).
Deviation − Alarm	The Deviation − Alarm occurs when there is a negative deviation between current travel (%) and input signal (%).
Temp High Alarm	The Temp High Alarm occurs when the measured temperature exceeds the upper threshold.
Temp Low Alarm	The Temp Low Alarm occurs when the measured temperature falls below the lower threshold.

4-9. Precautions

A message like the one below may be displayed on a host device. If so, take the indicated countermeasure to address the problem.

[475 Communicator]

■ If Actuator Size is set to "Param0" and GE (+/−) in "PID Parameters" is set to any value other than "0.0," then even if GE (+/−) is changed to "0.0" and GP, GI, and GD are also changed, and these settings are then transmitted, the background color of the changed items will remain yellow.

→ Return to the level above this and display "PID Parameters" again.

Chapter 5. Maintenance and Troubleshooting

5-1. Troubleshooting

The SVX is a precision instrument and requires the same level of care as any other field device. Unlike an air-actuated control valve, the SVX contains many electronic components and mechanical parts which must have proper settings and calibration.

Poor SVX performance is usually easy to correct by adjusting settings.

A Minor Failure indicates no immediate danger or serious trouble in the operation of the SVX. The SVX will continue to operate normally. Connecting the Field Communication Software (model CFS100) or HART Communicator or requesting a self-diagnostic through the supervisory monitoring system (model SVX100/102) is necessary to discover and determine Minor Failures.

A Major Failure indicates serious trouble in the operation of the SVX and, if no action is taken, may lead to damage to the SVX itself. Should serious trouble occur during SVX operations, the SVX will drive the valve to the fail-safe position. The Field Communication Software (model CFS100) or HART Communicator, or the supervisory monitoring system (model SVX100/102) are used to determine Major Failures.

5-1-1. Using the Field Communication Software (Model CFS100)

Refer to the operation manual for Smart Valve Positioner (CM2-CFS100-2010)

5-1-2. Using a HART Communicator

If you have a HART Communicator connected to the SVX, you can perform a selfdiagnostic:

step	Procedure
1	Make sure the HART Communicator is in the Ready State.
2	Select [5. Device Status] >> [2. Failures] or [3. Notices].
3	If a message is displayed, see the following page for a list of error conditions as well as the HART error code and possible solutions.

If after reading this troubleshooting section and solutions, the specifications of the SVX still do not match your requirements, or the SVX fails, contact your local

5-1-3. General troubleshooting

If, after attaching your SVX to a control valve and performing Auto-Setup or manualcalibration, you are experiencing performance problems, follow the troubleshooting steps below.

If the troubleshooting procedures below do not fix the problem, contact your Azbil Corporation representative.

SVX does not operate (no output air pressure)

step	Procedure
1	Make sure that the SVX feedback lever is not exceeding a 20° angle of rotation. If it is, add an extension bracket to the feedback lever to provide the necessary feedback lever length.
2	Check for air leaks in air supply.
3	Check electrical input signals.
4	Check Auto/Manual switch in Auto.
5	Check the flapper and the filter clears.
6	If communication can be made with the Communicator, perform self diagnostics and take action based on errors messages. Refer to “Troubleshooting Codes” on page 58.

Absence of full stroke or slow response

step	Procedure
1	Check the zero (fully closed) and span (fully opened) are properly adjusted.
2	Check the EPM drive signals are within range of 50+/-25%.
3	Check the filter and the flapper clean.

Hunting or Overshoot

step	Procedure
1	Change hysteresis setting from LIGHT to MEDIUM, or from MEDIUM to HEAVY. If problem persists, set hysteresis at HEAVY and change the actuator size setting to smaller PARAM numbers.
2	If problem persists, PARAM number sets zero (0) and varying the gain may be required for our valve, refer to “4-4-4: Control configuration” on page 37.
3	Check permissible angle of rotation of feedback lever.

Abnormal action of control valve

(although output air is supplied, the control valve does not operate properly)

step	Procedure
1	Change the A/M switch to manual (See page 59) and adjust the air pressure using the regulator valve from fully open to fully closed. Watch to see if valve stem moves smoothly. If it does not, this may indicated galling or hardening of the valve packing.
2	Confirm that the internal SVX settings for actuator size, hysteresis, etc. are appropriate for your control valve.

No communication possible with a Communicator

step	Procedure
1	Check input signal wiring. 4 mA is required for the SVX to operate.
2	Check that the Communicator and SVX are wired properly.
3	If the Communicator will not power on, check the batteries.

Troubleshooting Codes

Message	Cause	Correction
LO IIN	Input signal is too low (3.8 mA or lower).	Provide an input signal of at least 3.8mA.
VTD FAULT	(Valve position sensor) Feedback lever has fallen off or has turned beyond the allowable turning angle (± 20°C) ■ VTD connector has become disconnected. ■ VTD input line has been disconnected or short-circuited.	Check if feedback lever has fallen off and that it is within permissible turning angle. Contact Azbil Corporation.
A/D FAULT	(Analog/Digital conversion)	Contact Azbil Corporation.
NVM FAULT	(Non-Volatile Memory)	Contact Azbil Corporation.
RAM FAULT	(RAM error)	Contact Azbil Corporation.
ROM FAULT	(ROM error)	Contact Azbil Corporation.
SHUT ON	SVX is forced fully closed	Apply an input signal above the forced fully shut value. Use the communicator to check and/or adjust the forced fully open/close values (%).
HI/LO EPM OUT	Electro-pneumatic Module is outside normal range - No air is being supplied - Valve is closed - Galling of valve stem - Clogged nozzle - Clogged orifice - Input signal is 4 mA or less	■ Check air supply pressure ■ See that the input signal is 4 mA or greater ■ Confirm A/M switch is Auto ■ Clean air nozzle ■ Clean orifice ■ Adjust the EPM balance (Refer to page 63) ■ Change the input signal and check that the device is operating normally.
EXT ZERO ACTIVE	Zero and span adjustment switch is being made.	Release the zero and span adjustment switch.
MANUAL MODE	Dummy input signal from communicator.	Cancel the dummy current input.
FIXED EPM OUT	Dummy EPM pseudo-drive signal from communicator.	Cancel the dummy EPM signal.
OUTPUT MODE	Dummy pseudo-signal output state for communicator.	Cancel the dummy output.
CORRECT RESET	Data was reset at the time of shipment.	Set actuator type and other parameters before use.
OVER TEMP	Abnormal Temperature within SVX unit.	Check SVX temp and move it to a cooler location.

5-2. Maintenance

5-2-1. Auto/Manual selection switch

The Auto/Manual switch selects the control method for the pneumatic output from the positioner to be either automatic operation or manual operation.

Automatic operation

- An air pressure output corresponding to the input signal is output from the SVX.
- See Fig. 5-2.

Manual operation

- The supplied air pressure is output directly from the positioner.
- This allows manual operation using a pressure regulator.
- See Fig. 5-3.

⚠CAUTION
The double acting actuator has no manual operation function.

⚠WARNING
The valve may move suddenly when the A/M switch is operated. Prepare yourself and the process in advance so that the process is not adversely affected when the valve operates.

Structure of the A/M switch

The structure of the A/M switch is shown below.

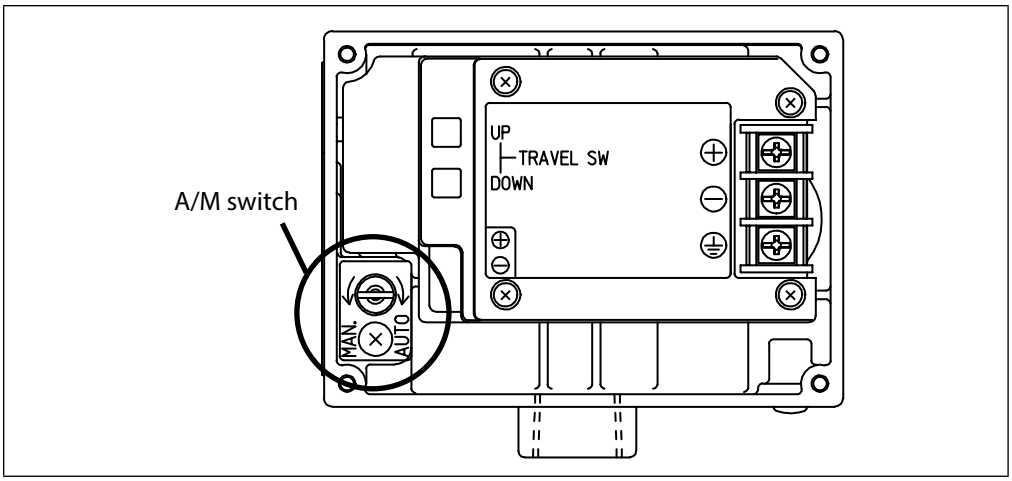


Fig. 5-1. Structure of the A/M Switch

Operating procedure

The technique for switching the A/M switch is shown below.

Switching from automatic (normal) operation to manual operation

■ Use a flat-bladed screwdriver to turn the A/M switch once fully in the counterclockwise.

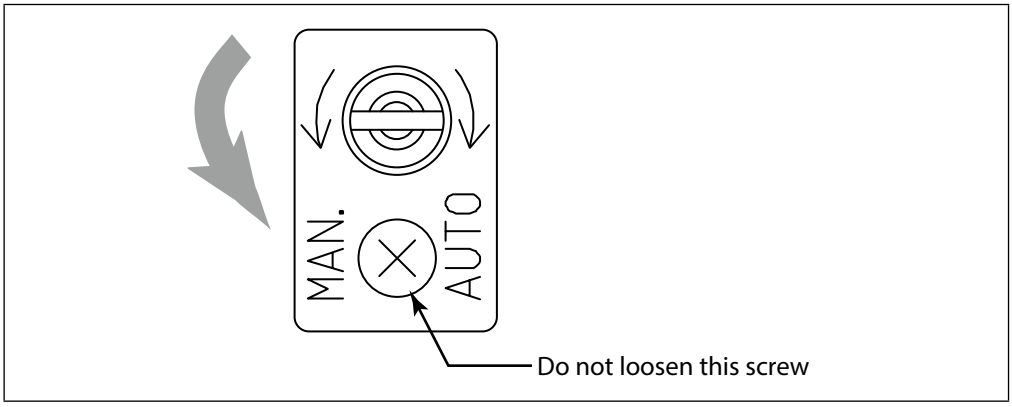


Fig. 5-2. Switching from automatic (normal) operating state to manual operating State

Note) Do not loosen the A/M switch cover plate screw.

Switching from manual operation to the automatic operation

■ Use a flat-bladed screwdriver to turn the A/M switch in the clockwise direction until it stops.

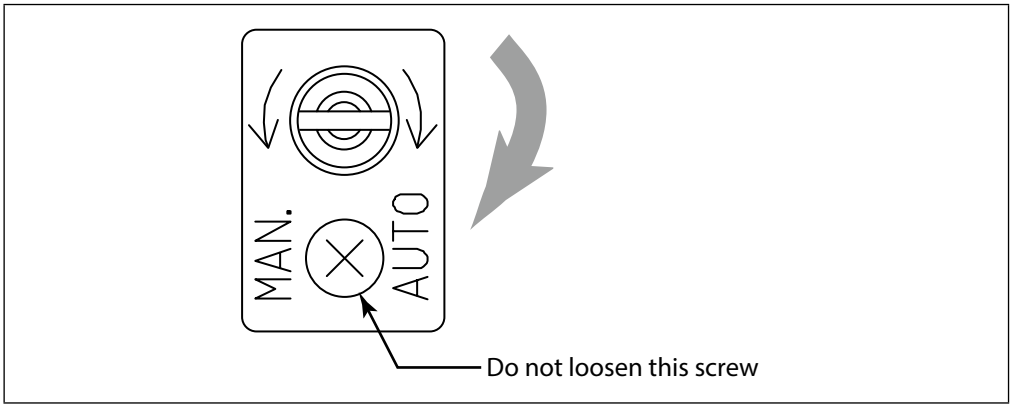


Fig. 5-3. Switching from manual operating state to automatic operating state

5-2-2. Filter replacement and restriction maintenance

The contamination from the instrumentation air that collects in the restriction in the SVX can be removed during maintenance. For the instrumentation air, use dry air which has been cleaned of 3 μm (or smaller) solid particles. Always use a Phillips screwdriver.

Procedure

Step No.	Procedure
1	Cut off the air supply to the SVX.
2	Remove the setscrews from the A/M switch nameplate section.
3	Turn the A/M switch to the MAN (manual) position.
4	Use nippers or another tool to cut the holder and remove the old filter. *Note) Dispose of the old holder and filter appropriately.*
5	Use wire to remove the contamination from the restriction (diameter 0.3 mm). *Note) Be careful not to damage the restriction when removing the contamination. Do not use an air gun. Do not allow any oils or greases to contaminate the restriction.*
6	Wrap a new filter around the A/M switch, and press it in place with the holder.
7	Screw down the A/M switch until it stops.
8	Reassemble the A/M switch section by holding the two O-rings and A/M switch cover plate together and then securely tighten using the setscrew.

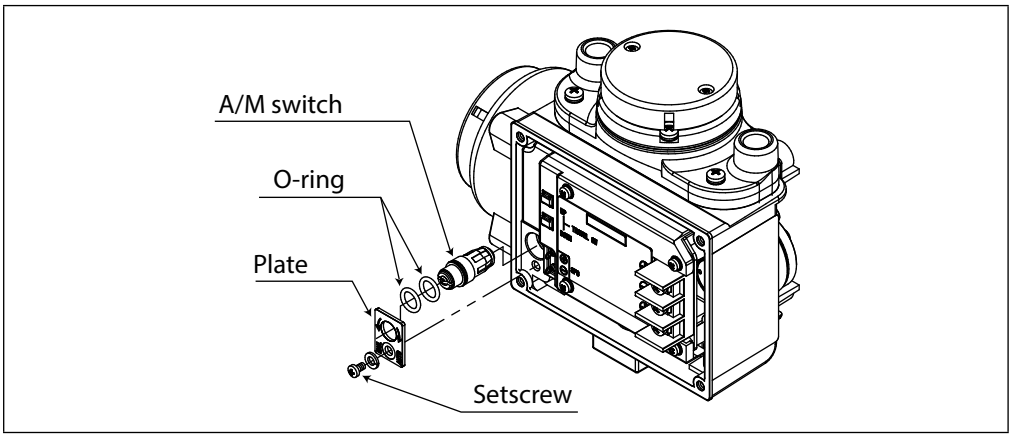


Fig. 5-4. A/M switch

5-2-3. Cleaning the flapper

If contamination from the instrumentation air has accumulated on the flapper, clean the flapper as described below.

⚠CAUTION
If air pressure is supplied to the SVX, the nozzle back pressure may change causing the valve position may change suddenly when the flapper is cleaned. Only clean the flapper in a state where no one will be injured and plant operation will not be adversely influenced even if the valve moves suddenly.

Procedure

Step No.	Procedure
1	Remove the cover.
2	Remove four screws from the cover plate.
3	Remove the plate by sliding it to the left.
4	Provide pieces of paper with a thickness of 0.2 mm. Standard business cards will do.
5	Use the scraps of paper to clean the contamination from the gap between the EPM nozzle and the flapper.
6	After cleaning the gap, reassemble the plate and cover.

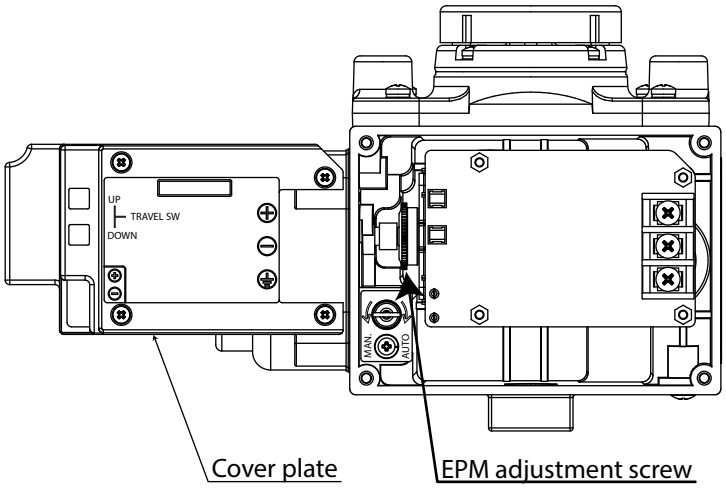


Fig. 5-5. EPM balance adjustment

5-2-4. EPM (Electro-pneumatic converter module) balance adjustment

In situations such as when excessive mechanical shocks and other external disturbances have been applied to the SVX itself, or when contamination from the instrumentation air has collected in the nozzle flapper area, the internal EPM (electropneumatic converter module) balance point may be displaced and the response characteristics degraded. This can lead to malfunctions occurring. If the balance point displacement cannot be rectified by cleaning the nozzle flapper area, EPM adjustment will be necessary.

⚠CAUTION
The EPM balance adjustment can cause the valve position to change rapidly. Only perform this adjustment in a state where no one will be injured and plant operation will not be adversely influenced even if the valve moves suddenly.

Procedure

Step No.	Procedure
1	Remove the cover and the cover plate.
2	After supplying the stipulated air pressure, set the input signal to 50%.
3	Observe the EPM drive signal using the communicator.
4	Adjust the EPM drive signal to have a 50% ±5% duty by turning the EPM adjustment screw.

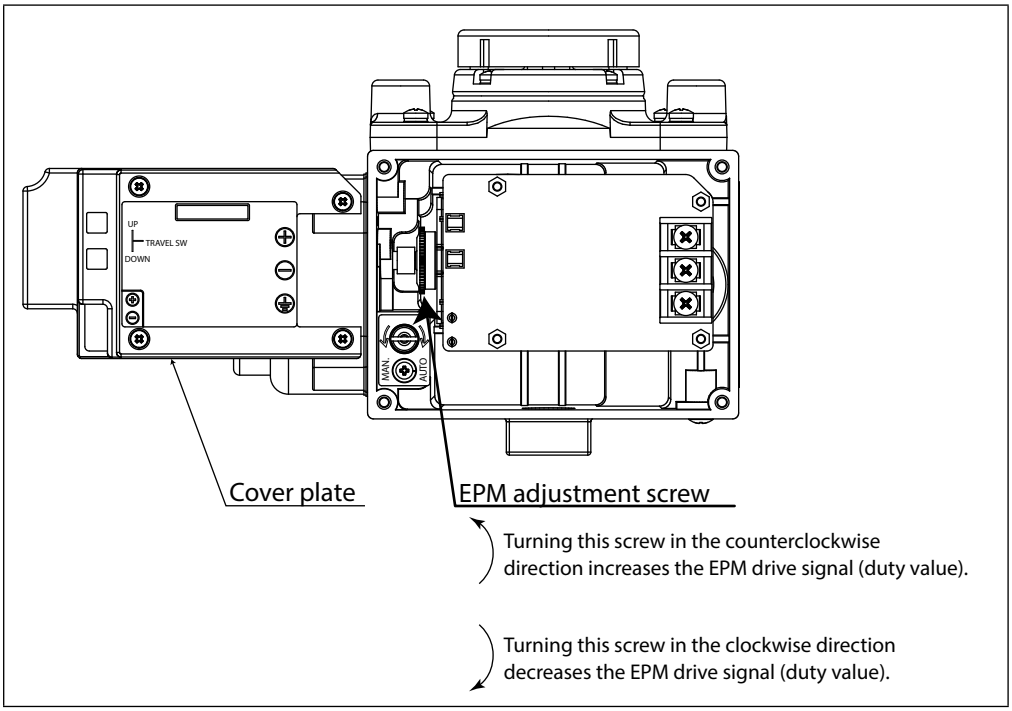


Fig. 5-6. EPM balance adjustment

5-2-5. Installation resistance test

⚠CAUTION
Do not perform the insulation resistance test. By performing this test, the built-in varistor for surge current absorbance will be damaged. If it required to perform this test, please carefully follow the following procedures.

Procedure

- Remove the external wiring.
- Short-circuit both plus and minus input signal terminals.
- Perform the test between these short-circuited sections and the grounding terminal.
- Applied voltage and criterion are listed below. To prevent damaging the instrument, do not apply a voltage of more than the value given below.

Criterion

The criterion of the test is as follows.

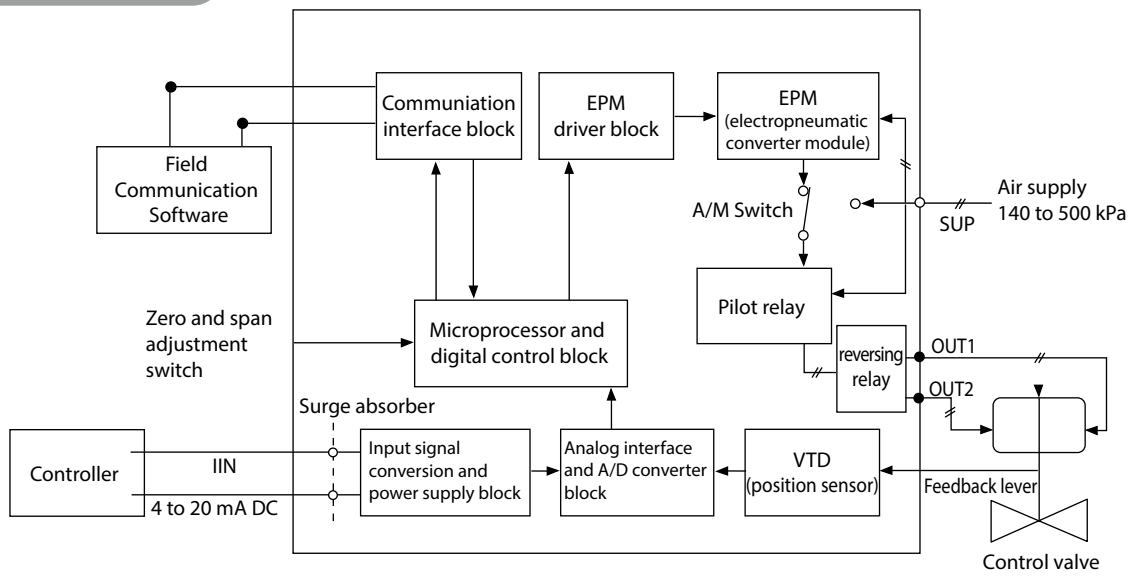
Test	Criterion
Insulation resistance test	2×10^7 Ω or above when test voltage is 25 V DC (25°C, 60% RH or less)

5-2-6. Table of default internal data values

Item		Default value
Tag number		XXXXXXXX
Output format		ANALOG XMTR
Burnout direction		DOWN SCALE
Actuator operation		REVERSE
Positioner operation		DIRECT
Valve operation		DIRECT
Actuator size		PARAM 1
Hysteresis		HEAVY
PID parameters (parameter 0)	P	1.200
	I	4.000
	D	0.5000
	GE	+/-0.000%
	GP	0.7000
	GI	4.000
	GD	0.5000
Flow characteristics		LINEAR
User defined flow characteristics data		(Pressure balance type adjustment valve (ADVB/ ADVM) linear characteristics data)
Valve fully closed value (LRV)		4.000mA
Valve fully open value (URV)		20.00mA
Forced fully closed input value		1.000%IIN
Forced fully open input value		99.00%IIN

5-2-7. SVX internal block diagram and SVX I/O flow

Model SVX100



Model SVX102

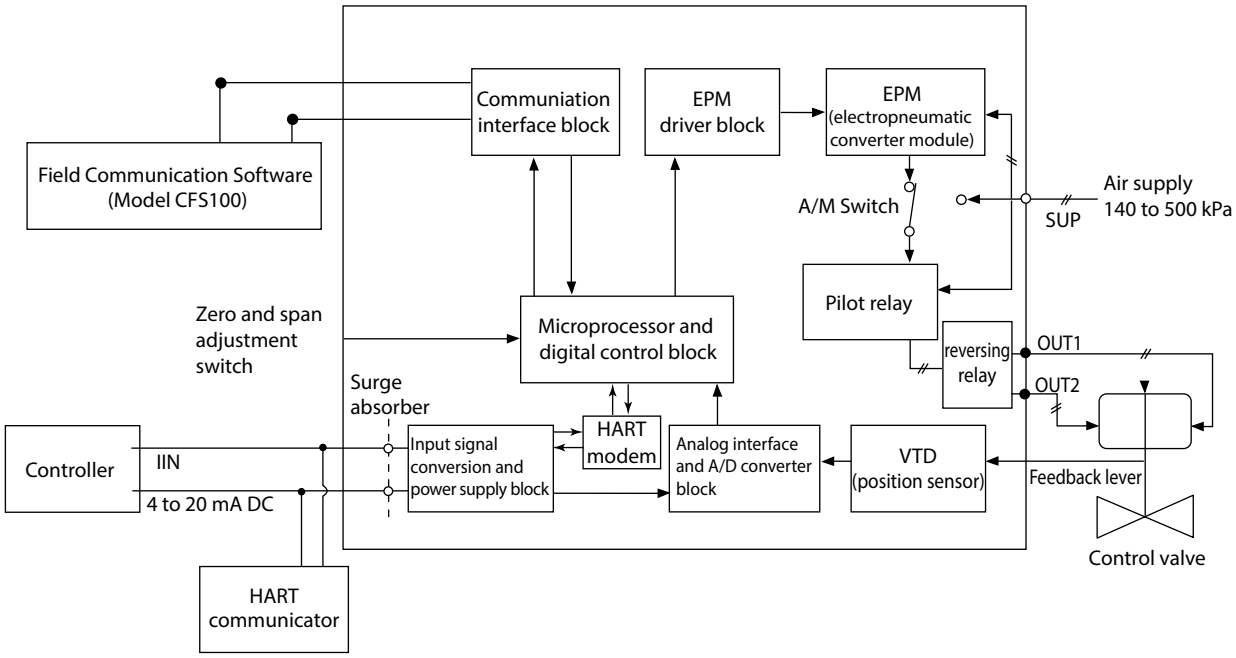


Fig. 5-7. SVX block diagram

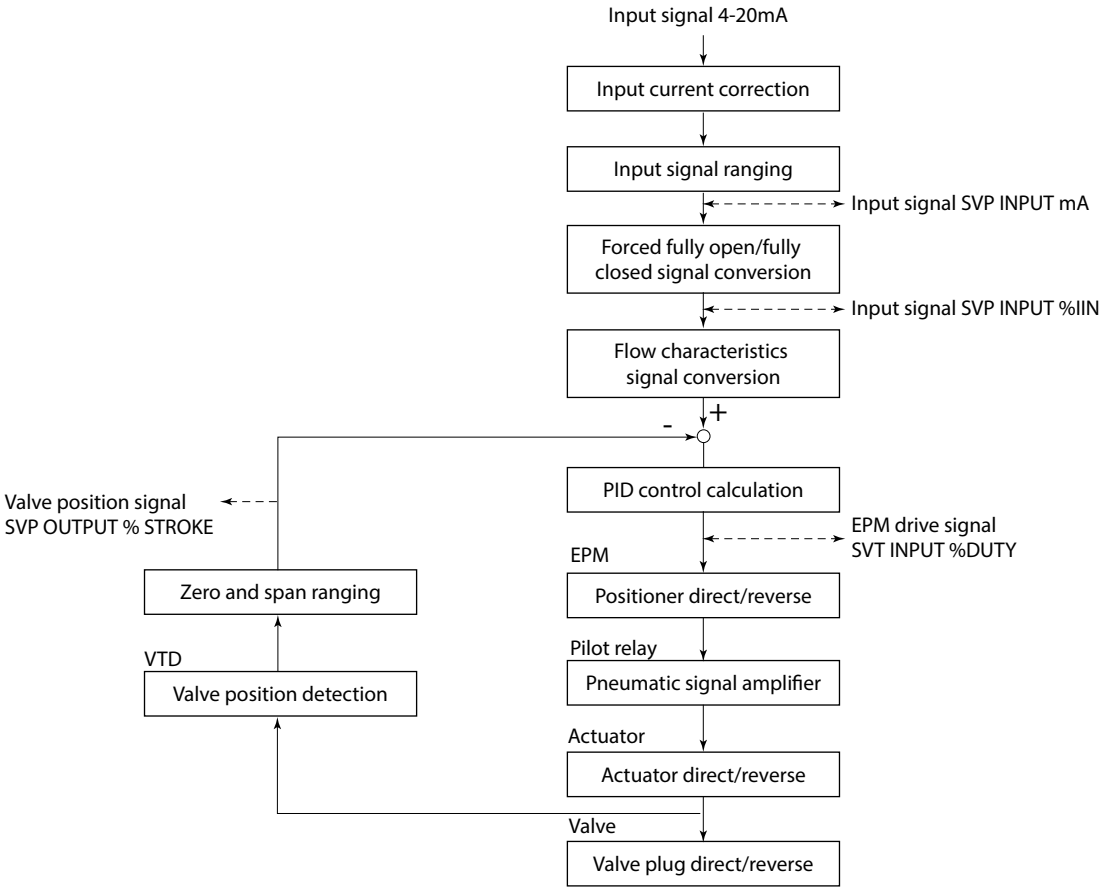


Fig. 5-8. SVX I/O flow

5-2-8. Replace parts

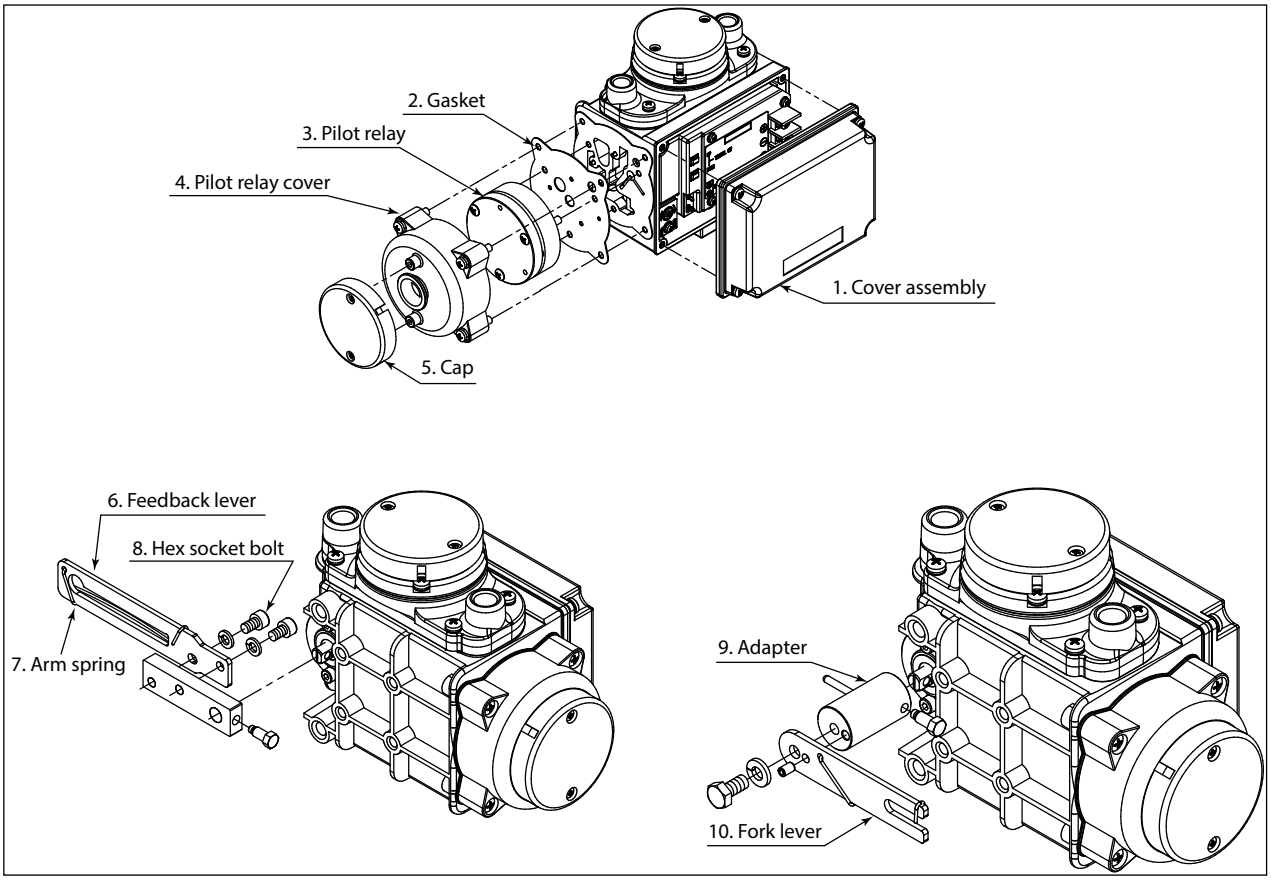


Fig. 5-9. Replacement parts

Table 5-1. Replace parts

No.	Parts	Qty.
1	Cover assembly (with screw, packing)	1
2	Gasket (pilot relay)	1
3	Pilot relay	1
4	Pilot relay cover	1
5	Cap	1
6	Feedback lever	1
7	Arm spring	1
8	Hex socket bolt with spring washer (M5)	2
9	Adapter	1
10	Fork lever	1

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.

You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

   1.1 Warranty period

   Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

   1.2 Warranty scope

   In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

   (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
   (2) Failure caused for other reasons than Azbil Corporation's product;
   (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
   (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
   (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
   (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

   Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

   You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

   (1) Regulations and standards or laws that your Equipment is to comply with.
   (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
   (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
   Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design,*1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,*3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

   *1. A design that is safe even if the user makes an error.
   *2. A design that is safe even if the device fails.
   *3. Avoidance of device failure by using highly reliable components, etc.
   *4. The use of redundancy.

3. Precautions and restrictions on application

   3.1 Restrictions on application

   Please follow the table below for use in nuclear power or radiation-related equipment.

	Nuclear power quality*5 required	Nuclear power quality*5 not required
Within a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Cannot be used (except for limit switches for nuclear power*7)
Outside a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Can be used

   *5. Nuclear power quality: compliance with JEAG 4121 required
   *6. Radiation controlled area: an area governed by the requirements of article 3 of "Rules on the Prevention of Harm from Ionizing Radiation," article 2 2 4 of "Regulations on Installation and Operation of Nuclear Reactors for Practical Power Generation," article 4 of "Determining the Quantity, etc., of Radiation-Emitting Isotopes,"etc.
   *7. Limit switch for nuclear power: a limit switch designed, manufactured and sold according to IEEE 382 and JEAG 4121.

   Any Azbil Corporation's products shall not be used for/with medical equipment.

   The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

   3.2 Precautions on application

   you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below. Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility

to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

(1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
(2) For use of specific purposes, such as:
    * Nuclear energy/radiation related facilities
      [When used outside a radiation controlled area and where nuclear power quality is not required]
      [When the limit switch for nuclear power is used]
    * Machinery or equipment for space/sea bottom
    * Transportation equipment
      [Railway, aircraft, vessels, vehicle equipment, etc.]
    * Antidisaster/crime-prevention equipment
    * Burning appliances
    * Electrothermal equipment
    * Amusement facilities
    * Facilities/applications associated directly with billing
(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. After manufacturing is discontinued, we may not be able to provide replacement products even within the warranty period.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

(1) Installation, adjustment, guidance, and attendance at a test run
(2) Maintenance, inspection, adjustment, and repair
(3) Technical guidance and technical education
(4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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